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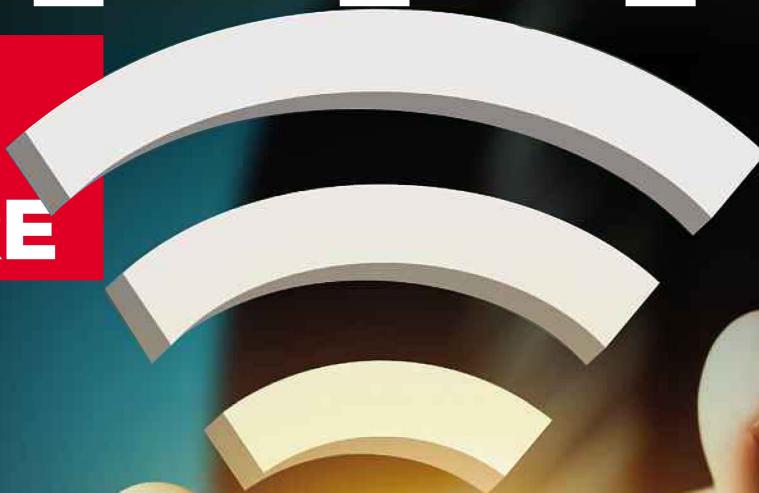
Computing in the know

Plus

- The Most Expensive And Embarrassing Software Errors Ever
- Do Website Paywalls Actually Work?
- Hands On With The Official Raspberry Pi Touchscreen

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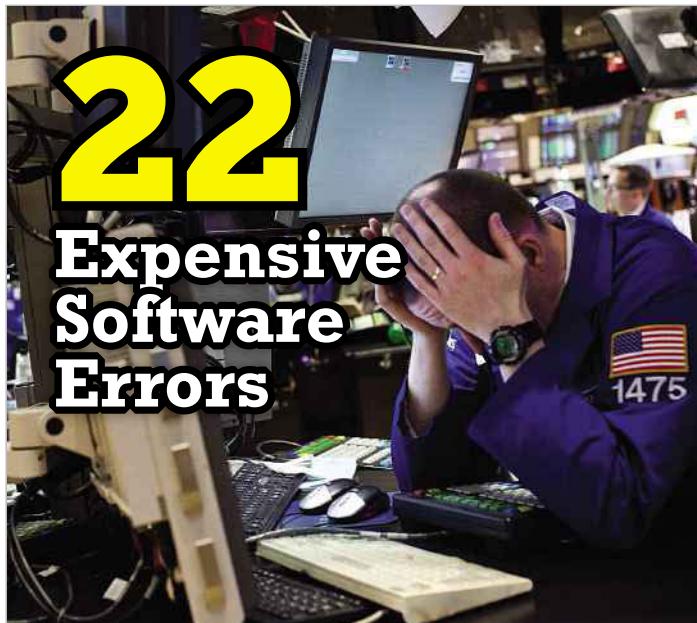
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The End Of Wi-fi?

08 The End Of Wi-fi?

Every so often, we get a new wi-fi standard. Compared to its predecessors, this new version of wireless networking will be faster: this is just something we've come to expect. However, these greater speeds aren't without drawbacks, one of which is a lack of range. Plus there's surely only so much you can get out of the radio bandwidth before you run out of capacity. The answer, though, as David Crookes tells us, could be with light-based technology...

18 Pi Display

The Raspberry Pi is a fantastic piece of kit, but one thing it's missing is its own screen. Of course, displays have been available for it for a while, but it's only now that there's an official touchscreen, so you can interact with the Pi more easily. David Briddock has been checking it out to see what it offers

22 Expensive Software Errors

If you're typing something at home and you make a mistake, it's probably not going to be a huge problem. For some people, though, a seemingly small typo or miscalculation can end up costing millions. We've been looking at some of the most disastrous bugs ever and how long it took to clean up the mess afterwards

46 Dual Band Routers

If you have a high-speed internet connection and/or you transfer files around your home network a lot, then you really should make sure you have a decent router. To help you choose one, we've been looking at six, which we think could be just what you need to get the most from your network

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56 Green Apple

Whether or not you like Apple or its products, you can't deny how successful it is. It makes huge amounts of money and its products are absolutely everywhere. That's great for Apple and its shareholders, but what about the planet? What is the environmental impact of all this, and what is the company doing to be green?

62 Website Paywalls

The web is great for spreading information (as well as misinformation), but it's not always so great at paying people for that content. Advertising, of course, is the major source of funding, but what if you don't want to go down that road? You could set up a paywall, like some sites have. The question is: can you really succeed? Aaron Birch reports



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Is LiFi The Successor To Wi-fi?

Could a bright new alternative one day replace wi-fi? **David Crookes** talks to LiFi pioneer, Professor Harald Haas

There is no denying that wi-fi has revolutionised our lives, allowing us to speedily access the internet while on the move and removing the hassle of wired connections. It has saved us lots of money by letting us conserve our mobile data plans, and it has become a utility just like electricity and water for so many of us. You only have to gauge our reaction when it slows or stops working: we get on the phone and argue the toss with the service provider and we become stroppy at the sheer inconvenience of it all.

At the same time, though, wi-fi is not perfect. Since it uses radio waves to transmit data, it is inherently limited and there is a set bandwidth too, which can cause problems when many devices are used at the same time. Wi-fi is also hackable, especially when the waves penetrate beyond the walls of your home and office and allow others to see and potentially access it. What's more, as more and more devices become wi-fi enabled, the issues are only likely to worsen as the signal interference increases. We may rely on wi-fi today, but experts know that it's important to develop other systems too, and one of them may just be the long-term answer.

66 The visible light spectrum is 10,000 times larger than that of the radio spectrum 99

Step forward LiFi, one of the latest systems looking to compete with wi-fi. Short for 'Light Fidelity', it uses light to transmit data rather than radio waves by making use of the semiconductors that are built into ordinary, off-the-shelf LED light bulbs. It may sound bizarre, but by exploiting the change in brightness – so modulating the intensity of the LED by turning the light on and off at very high speeds – it is possible to create binary information, which can then be interpreted by a receiving device. The result is data transmission that will allow computers, tables and smartphones to connect to the internet.

This is achieved by beaming out the 1s and 0s created by the LEDs to light receivers on various devices which then translate the signal into real-time data. While LiFi currently offers real world transfer rates of around 150Mb/s, tests have shown connections can be anything up to 10Gb/s – some 250 times faster than the average broadband speed. It is little wonder that people have been getting rather excited about it.

Among those who have worked hard on the technology is Harald Haas, a professor of engineering at the University of Edinburgh. It was he who coined the term LiFi and it was he who got the ball rolling some four years ago when he gave a TED Talk about the subject in 2011. Discussions about the technology soon gathered pace, and it has become one of the most important emerging methods of data transfer. In fact, Prof Haas is so convinced of its future, he has co-founded a spin-out company called PureLiFi which has been working on products that take advantage of LiFi. It has been valued at more than £14 million and it recently raised £1.5 million in its latest round of investment.



How To Improve Your wi-fi

It would appear LiFi is a few years away from being available for consumers so, in the meantime, it's worth looking at ways to make your wi-fi that little bit better.

1. Make sure you're up-to-date

In order to get the fastest wi-fi you possibly can, you will need to ensure that your device supports the latest wi-fi standards. You will see the same number prefixing all of them – 802.11 – but it's the letters at the end which are the most important part. The current best standards are 802.11n and 802.11ac, the latter delivering the fastest speeds. Check your router to see what it can deliver and think about upgrading if it doesn't support either of these and you require more speed or a more reliable signal. Sometimes, a simple call to your internet service provider will bag you an upgraded router.

2. Get the router in the open

If you want your router to beam out the best wi-fi signal, then you're going to have to meet it half way by helping it out a little bit. That means locating it in a spot that allows the signal a better chance to reach your connected devices. Think about where you will use the wi-fi the most and consider how many walls, doors and floors are situated between the devices you use most and the router. At the same time, you need it close to where your phone connection is. Look into getting signal boosters, or even HomePlug technology, if you get wi-fi blackspots in your home.

3. Remove any interference

There are certain appliances most of us now have that have the potential to ruin the signals we get from our wi-fi. The list of such devices includes, but is not limited to, microwaves and cordless phones (our friends at the website Alphr produced a handy guide to these devices: tinyurl.com/njdymah), so don't place your router close to those items because the signal you get will suffer. The microwave, especially, can wreak havoc because it operates close to the 2.4GHz band that 802.11n also operates on. Then again, if it is proving to be too much of an issue, get the microwave checked out because it may mean that its shield has become damaged.

4. Get the right channel

If you have ever called an ISP about dodgy wi-fi, we'd wager that one of the things they will have asked you to do is change the wireless channel upon which your router is transmitting. The idea behind this is to hope that you'll move to a channel that no-one else in the area will be on so that any interference is kept to a minimum. Play around with the different channels or use a program such as WiFi Analyzer to seek out the most free channel. You can find such programmes by going to tinyurl.com/95zyxpn.

There are also guides dedicated to explaining the channel changing process for various popular routers online including Sky (tinyurl.com/o4calr7), Virgin Media (tinyurl.com/owjx2m6) and BT (tinyurl.com/d9lvc9s). ▶

◀ 5. Lock down your wi-fi

One of the benefits of LiFi over wi-fi is that the range is better directed and so people can't simply pick it up when they pass by. This gets around the issue of people being able to hack your wi-fi, an action that will inevitably slow down your connection. Make sure you have set up your wireless security so that only you and those you wish to are able to access your wi-fi. If you want to know more about this, go to the wi-fi Alliance website at www.wi-fi.org/discover-wi-fi/security.

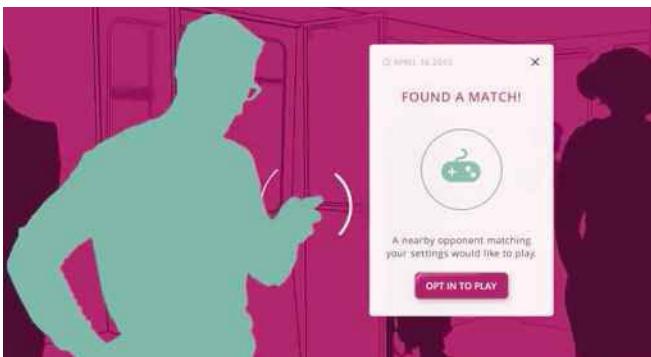


Wi-Fi Aware

Although work is progressing on LiFi, that does not mean that wi-fi is not pushing new frontiers. One of the new technologies includes Wi-Fi Aware, which looks to extend wi-fi capabilities so that it allows nearby smartphones to find each other even if there is no cellular, GPS or hotspot connection.

With no infrastructure access point, it will allow fellow users to pinpoint each other with uncanny accuracy. App developers will be able to work with Wi-Fi Aware so that, for example, two gamers playing the same title will be able to instantly hook up when they are passing each other. Thankfully, it will be app-centric and users will be able to control their privacy and opt-in or out of identify disclosure.

Wi-Fi Aware is currently undergoing certification and the smart money is on smartphones and tablets having the technology available for consumers in the next-generation, so some time next year, we'd imagine.



"The idea of LiFi is a fairly old idea – even Alexander Graham Bell had thought of using light for communication when he developed the photophone in 1880," Prof Haas tells *Micro Mart*. "But the real idea of LiFi basically emerged when LED lights came out because they added a new twist, allowing the capability of transmitting data really fast. I saw this when I started a project 12 years ago in my university to try and find out if there is a way to transmit data very quickly using modulation technique algorithms to encode information on LEDs. That experiment proved to be very successful."

“**LiFi street lamps will transmit data when people pass beneath them**”

Prof Haas believes consumer units are no more than five years away from market, and he also reckons each of us will be commonly using this technology alongside 4G, 5G and wi-fi. He says there are 14 billion pre-existing LED light bulbs out there, which only need an additional Ethernet-wired ceiling-based device to be attached in order to make them compatible with the new technology. With such a strong infrastructure, it only seems a matter of time before LiFi is taken on board in homes and businesses around the world.

One of the key elements to this technology is that it merely adds to what is already there: the core functionality of the light bulb will not be affected by its additional role and, since the flashes are so fast, it looks as if the light is always on. That means that people will still see normal uninterrupted illumination from their bulbs, with the only snag being that LiFi bulbs would have to be kept on in order to transmit data – though they could be dimmed to the point that they were not visible to humans, and yet still be functional. It makes LiFi a very neat solution and one that is sure to be attractive to lighting companies looking to incorporate wireless technology into their products in the future.

At the same time, there is also a lot more scope with the technology. By making the semiconductors work at ever faster speeds, the rate of transmission can be increased. This means that LiFi has the capability of becoming one of the fastest connections around and, if you're still not convinced that LiFi is actually feasible, then consider this: we have been using this sort of tech in a familiar form for a while now.

Pick up your remote control and change the channel. You've just seen a low-level form of LiFi in operation. As Prof Haas explains to us, remotes contain infrared LEDs which, when turned on and off, create a low-speed data stream that operate at up to 20,000b/s. But by transmitting thousands of data streams in parallel as in LiFi rather than just a single stream as with remote controls, the speed is increased and the amount of information that can be sent back and forth is also boosted.

"The visible light spectrum is 10,000 times larger than that of the radio spectrum," he continues. "This means LiFi becomes a big resource – a big fat pipe if you want – through which data can shuffle through." The infrastructure is also much larger. As we already know, we have lights all around us. They are in our home appliances, our cars, in the streets, within lamps and, of course, in our ceilings too. The 14 billion LEDs out there more

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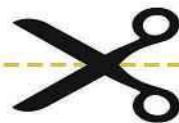
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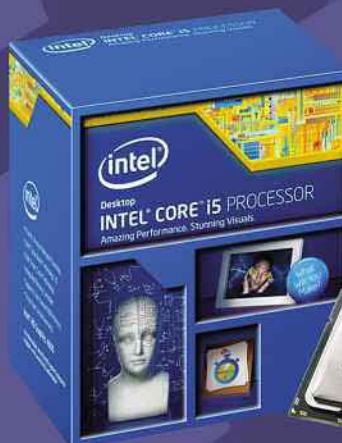
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A This image by PureLiFi shows how this impressive technology works. You can see that 3G and 4G is beamed bi-directionally from a station to a web-enabled device, and that wi-fi does the same from a router within the home, while LiFi data is sent downward from LED bulbs in the ceiling

than dwarf the 1.4 million radio cellular base stations that are installed. It may well be that, in due course, we don't need as many radio masts, saving money and the environment. This is particularly useful as technology advances.

"For the second generation of communication, the distance between radio masts was 35km maximum but with 4G the distance between the masts has become 200 to 500 metres and with 5G that will go down to 50 metres," he tells us. "So imagine a city where you have a radio mast, albeit a small one, every 50 metres and imagine this is essential for transmission in order to provide ubiquitous coverage. If you have a lighting system and you have replaced lights with LEDs, you don't need this. It is also a very green technology because you could use a street lamp and save energy. You'd be reusing and repurposing these lights for data communication."

In the UK, more and more street lamps are indeed being converted to LED technology as the local authorities look to reduce carbon emissions. You may even have such a system in your street – they are certainly noticeable given their hallmark is a crisp white light rather than an orange glow of sodium. While some feel they give off less light and so make for darker streets, they are cheaper to run. They also give off much less light pollution and, as a by-product, will be able to deliver the internet to your devices while you are out and about. "Every street lamp could be a free access point," Prof Haas told his TED audience. He also says that LED lighting on aeroplanes will allow people to use the internet in flight.

The possibilities appear endless. "Absolutely so," he asserts. "We are at the start and we are just where we saw the first mobile phones – those huge devices that are quite unlike what we see today. LiFi is still fairly big and it is not mass market ready, but in five years time it will grow on a very large scale."

In order to take advantage of this, PureLiFi is working on its third generation of products and efforts are at an advanced

stage. "We demonstrated a fully networked LiFi network at the Mobile World Congress," he says. "It was the same as wi-fi but you can move and you can have a lamp that is transmitting to multiple users. It's called LiFlame." The system provides a 10Mb/s downlink and a 10Mb/s uplink over a range of up to three metres with standard light fixtures. It creates a data rate density of 2Mb/s per square metre.

"We have been piloting an installation for the early adopters in the defence and security industry as well," Prof Haas continues. "We also have it in the lighting and communication industry." One of the most eye-catching developments has been a potential deal with the Golden State Warriors basketball team in California. Prof Haas wants to see LiFi technology

“It is highly likely that the full extent of the possibilities of LiFi will not be seen for a few years yet”

Wi-fi In Numbers

- 11Mb/s – the data speed delivered by 802.11b
- 2000 – the year wi-fi was coined as a term
- 2 billion – number of wi-fi devices reached by 2013
- 25,000 – number of products certified by wi-fi Alliance
- 5,600,000 – number of public wi-fi hotspots in the UK
- 1 – countries to have banned wi-fi in nurseries (France)

Finalist: UK's Most Innovative Small Cyber Security Company

pureLiFi is a finalist for the "UK's Most Innovative Small Cyber Security Company" 2015 with our Li-Flame system and will pitch-off at InfoSec Europe, 4 June

pureLiFi, the home of LiFi, is recognised as the leader in the field – the use of the visible light spectrum instead of radio frequencies to enable wireless data communication. pureLiFi provides ubiquitous high-speed wireless access that offers substantially greater security, safety and data densities than Wi-Fi along with inherent properties that eliminate unwanted external network intrusion. In addition, the integration of illumination and data services generates a measurable reduction in both infrastructure complexity and energy consumption.

▲ PureLiFi has attracted £1.5 million in funding from a group of investors led by angel network London & Scottish Investment Partners

Why LiFi Is More Secure Than Wi-Fi

As we have seen, LiFi uses LED lights to create data that is then transmitted to devices for interpretation. A tiny hole on the device receives the light and converts what Prof Haas says are subtle changes in the amplitude into an electrical signal which is then converted back to a high-speed data stream.

In order to work the data receiver would have to be in sight of the transmitter-bulb as visible light does not penetrate solid material. This has an advantage, however. LiFi is able to establish a secure, almost personal connection. "It is really safe and it also provides more secure wireless communication because light doesn't go through walls and that is opposite to what you see with wi-fi," Prof Haas offers.

"When you check for available wi-fi networks you will typically find 10, 15, 20 of them all around your and this means that people can basically hack into them if they really wanted to. With LiFi that doesn't really happen because the walls block the light." It means your next door neighbour or the people across the street are not going to suddenly find their way into your wireless connection.

used in a new cutting edge sports and entertainment complex in San Francisco by 2018. LiFi street lamps will transmit data when people pass beneath them. "We are hoping to get this technology up and running within their new Arena," he says. "With a high density of people there is a need for individualised replays for teams: wi-fi doesn't have the bandwidth but LiFi in such an environment will do."

“The people across the street are not going to suddenly find their way into your wireless connection”

It is highly likely that the full extent of the possibilities of LiFi will not be seen for a few years yet, though. There has been talk of cars being able to communicate with each other via their LED headlamps and of kitchen appliances being linked to the internet through LiFi. The market is projected to be worth as much as \$9bn by 2018, but the figure continues to rise as



▲ The new stadium for the basketball team Golden State Warriors is exploring the possibilities of LiFi

more and more companies take an interest. Major providers and technology companies have to be on board, and there are signs that they will be. "We have been speaking to a number of service providers – the main service producers across the country," Prof Haas adds.

In the meantime, he is keeping his eyes well and truly open to the possibilities. "Every time I walk out and I see a light I see LiFi and I see what we can do in terms of services. Every new connection enables up to 100 new applications and connectivity enables huge additional differences in application development on top of it. We have seen this with the iPhone – a little device that connects people. See how many applications are running on it. Now imagine the lighting system in your home and the applications that the lights could provide. This could monitor patients and it could help to boost the economy."

As well as Prof Haas and the University of Edinburgh, top brains from other educational establishments are involved. There is a programme called Ultra-Parallel Visible Light Communication which includes experts from Universities in St Andrews, Strathclyde, Oxford and Cambridge as well as Edinburgh – and this had helped put the UK at the forefront of LiFi technology, and will hopefully keep it there. Prof Haas wants Edinburgh in particular to be seen as the City of LiFi. Scotland, he says, will benefit enormously from the systems uptake.

Will LiFi replace wi-fi, 4G and all of the rest and become the dominant technology, though? Prof Haas has a surprising answer: "No." Yet he does think that it will become one of a number of ways in which people will connect over the years and that it is important to have new and varied methods of getting online. "It will be an integral part of how people connect," he says. "Everyone will be used to it and it will be a part of the mix of wireless communication."

He points to ever-changing technology and the ways in which we have adapted to them. Now, he says it is about getting devices to talk to each other more efficiently. "We now have different ways of communication between humans with the iPhone and social networking but we will see a massive communication between machines to make our environment smarter," he offers. "So, if we connect all of the things around up to the internet, I think we will see a massive load of data will be carried by light. It provides an additional level of connectivity that otherwise wouldn't exist because radio's bandwidth is too limited. But we will see this as part of the mix of wireless connectivity 10 years from now. It's hugely exciting." **mm**

Where Can You Use LiFi?

LiFi appears to be a very flexible wireless connection, which is able to perform well in some of the strangest of locations. Since it uses light to transmit data, it is entirely safe and so it means that it will be fine on oil platforms and in any situation where risk needs to be minimised. It will even be okay to use LiFi on planes – the LED lights would simply transmit what you need at high-speed without fear of bringing the aircraft crashing back down to Earth.

What may be surprising, though, is that LiFi can also work underwater. This has already been noticed by the U.S. Navy, which is funding a research programme that is looking to develop the technology. It is possible that LiFi could be used to significantly improve on existing methods of communication between submarines, as when it is refined it should work better than radio waves, which distort underwater.



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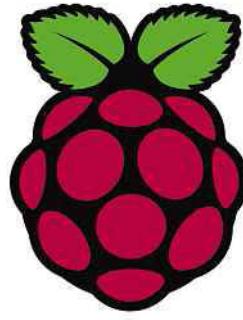
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Official Raspberry Pi Touchscreen Display



David Briddock examines the latest official Raspberry Pi accessory

It's been a long wait, but on the September 8th the Raspberry Pi Foundation launched its official Raspberry Pi touchscreen display kit. Since then, the display has been available for purchase from the Pi Swag Store (goo.gl/SFNms5) for £48, or from RS Components/Allied Electronics, Premier Farnell/Newark and others at a similar price.

Originally envisaged to be a six month project it overran by around 18 months, partly due to a change of focus and priority in particular releasing the Raspberry Pi Model B+, Model A+ and Pi 2 boards. But, just like the popular Pi camera module (which also arrived much later than originally planned), quality and affordability were goals that couldn't be compromised. So let's see if the wait was worth it.

Design

The Foundation's goal was to offer a quality, embeddable display for the Raspberry Pi. Something easy to setup, yet more capable and better value than alternative Pi displays already on the market. After an extensive hardware evaluation process the final choice was a 7" industrial-quality display from the UK-based Inelco Hunter (inelcohunter.co.uk). The display's key features are as follows:

- 7" touchscreen
- 800 x 480 pixel resolution
- RGB 24-bit colour
- 60fps video support
- 10-point capacitive touchscreen
- 70° viewing angle
- Metal back with Pi mount holes

This adapter board is also used to handle video signal conversion. In particular the parallel signals from the display's native interface are converted to ones compatible with the Pi's built-in Display Serial Interface (DSI) port. The decision to go with DSI wasn't a

“ Quality and affordability were goals that couldn't be compromised ”

Compatibility is an important element. However, at the time of writing, the screen is only compatible with the new Pi 2 Model B, the Model B+ and the Model A+. Which means owners of the older Raspberry Pi Model A or Model B are currently out of luck. At the rear of the display there's a special adapter board. The Raspberry Pi is mounted on this board and can power the display directly from power pins on the Pi's GPIO connector. Power can alternatively be sourced from a separate USB power supply rated for at least 500mA.

straightforward one, though, and a significant percentage of the two year gestation period was apparently dedicated to deciding on the most appropriate type of display connection technology.

Display Technology Choice

The Pi already has an HDMI socket, a universal interface capable of supporting high resolutions and not susceptible to electro-magnetic interference. However, the HDMI electronics required to convert between HDMI and the native panel interface can be quite expensive.

**▲ Raspberry Pi 2**

A Display Bus Interface (DBI) is another option, but it's a rather old display technology and, once again, the memory and hardware requirements mean DBI screens tend to be quite expensive. By way of contrast, Display Parallel Interface (DPI) screens are readily available and relatively cheap. Yet, sometimes, they have been known to generate troublesome electromagnetic noise and are prone to high power consumption. DPI connection would also use quite a few GPIO connector pins, which would preclude the connection of other GPIO accessories.

Every Pi already has a high-speed Display Serial Interface (DSI) port. The electromagnetic noise is minimal and power consumption is low. Unfortunately DSI displays are typically made on request, for special niche products.

After much thought the final solution was to employ both DPI and DSI. Quality DPI displays (with high contrast, rich colour, accurate pixel resolution and wide viewing angles) could be obtained at the right price. And DSI ensures the GPIO port pins remain free. All this means the kit has a ribbon cable that goes from the special adaptor board to the Pi's built-in DSI port.

**► Raspberry Pi
Touch Display Kit**

Kit Form

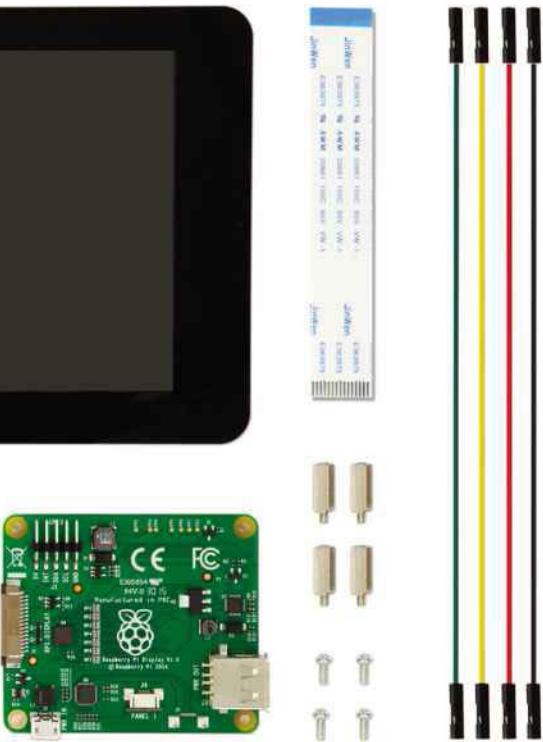
For the time being official touchscreen displays are only available in kit form, which is inline with the general Pi maker philosophy. And it proved to be no problem for consumers judging by the initial rush to own the touchscreen display, with initial stocks disappearing almost overnight. The display kit includes:

- 7" Touch Display
- Adapter Board
- Adapter Board mount and screws
- Adapter Board GPIO jumper wires
- DSI Ribbon cable
- Perspex frame (in various colours)

As you can see, and as you would probably expect, some basic assembly is required. As always care needs to be taken to ensure electronic components or other parts aren't damaged in the process and that all the connections are made correctly. You'll need to be careful, and then double-check everything, especially connections to the GPIO pins.

You can find a number of step-by-step kit construction explanations online that will walk you through the process. There are a few video demonstrations too, for example this handy little talk/walk-through video created by Alex Eames for his RasPi.tv blog (goo.gl/QaC9Wu).

You will need to type in a few commands to install the display hardware drivers (see boxout for the details). However, once this is done the Raspberry Pi automatically detects the screen and assigns it to be the default display rather than the one connected to the HDMI out).



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▲ Raspberry Pi Touch Display Rear View

Dual Displays

For greater flexibility it's possible to use both the new touch display and an HDMI-connected display at the same time. However, at present this requires a bit of fiddling around with settings, and therefore some knowledge of Linux video drivers. This should change pretty soon, maybe with new Pi configuration options to make the dual display experience an easier process.

Apps will embrace a dual display mode too. In fact, the Omxplayer video player app (elinux.org/Omxplayer), which came out of the popular XBMC project, already has the capability to handle secondary display output.

You can play a video on the touch display (assuming it's the default display) by typing:

```
$ omxplayer video.mkv
```

Then start another video onto the HDMI display by typing:

```
$ omxplayer --display=5 video.mkv
```

Touch Unfriendly OS

Having a touchscreen is great, but there is a little problem. For now at least, what's possible through touch interaction is rather limited. The official Linux-based Raspbian operating system doesn't come in a finger-friendly configuration as standard. Nor does any other alternative Pi OS for that matter.

To help with this, though, the touchscreen driver outputs both standard mouse events and full multi-touch (10-finger) events, and therefore can imitate a mouse. Also, there's

a virtual on-screen keyboard integrated into the latest Raspbian OS release. However, at normal display resolutions the typical stubby finger stab has problems with those mouse-optimised menu selections and buttons. Just making everything bigger drastically reduces the working screen area. Yet, with a little software hacking it's possible to improve this situation yourself.

Kivy To The Rescue

Kivy is a Python GUI development tool for cross-platform app development. The original goal was to provide an open source development tool for touchscreen devices like smartphones and tablets. Being cross-platform means it also runs fine on the Raspbian OS or other Linux-based operating systems. So, thanks to Kivy you can create touch-friendly apps and games for the touch display.

Pi team member Matt Richardson (goo.gl/iWOXTH) has been experimenting with Kivy and created a touch interface that can interact with Raspberry Pi's General Purpose IO (GPIO) ports. It's a pretty basic demo at present, yet the short video (goo.gl/9JUEii) does give a glimpse of Kivy's potential.

If you'd like to find out more about Kivy, or install it onto your own Raspberry Pi, there's loads of information at kivy.org/docs.

Hardware Options

It's early days for this kit, but the overall quality seems assured if the time the Foundation spent sourcing the components and ensuring Raspberry Pi compatibility is anything to go by. Some things may change, though, like the

Display Install Commands

- \$ sudo apt-get update
- \$ sudo apt-get upgrade
- \$ sudo reboot

fact that the touchscreen currently comes in kit form. Even a no-soldering setup doesn't suit everyone, so we can expect to see pre-built options appearing soon. If it could cost around \$100, it will still be great value.

It's also possible that this touchscreen could be incorporated into all-in-one, fully-integrated products. For example portable infotainment systems and various embedded scenarios, such as a Pi-powered imitation of an iPad mini or a smaller-sized Android tablet. Most of the innovation is likely to come from the maker community, though, as the display's portability will itself give rise to a multitude of new options. It should be interesting, and no doubt entertaining, to see what sort of devices and hardware hacking projects appear over the next year.

Software Options

The biggest changes are likely to come from software, however. As we mentioned earlier the user experience (UX) needs to be adjusted for touch-centric operations, which is a significant challenge. The scope of this could be anything from a completely new touch-friendly UX layer, to specific apps and games that take full advantage of touch interaction (maybe using the Kivy toolkit).

The Raspberry Pi Foundation has already announced a number of touch-enabled educational apps, which it hopes will help to simplify learning and coding activities on the Raspberry Pi, and the official Raspbian operating system could itself see some additional updates; switching into a touch-friendly UX mode at boot-up, for example, or a much simpler way to set up a dual display configuration. The potential in the games area alone is enormous. What about touch-enhanced versions of popular retro-style games? Or even gesture-enabled big-name classics like *Elite* and *Minecraft*?

Bright Future

This is the most impressive Raspberry Pi accessory since the 5MP camera module (which is now just £21 from The PiHut). Just like the camera module, the quality and functionality offered at the price is outstanding. It may be enough to entice commercial organisations to build a range of associated accessories, which in turn could fuel many new open source software projects. All of a sudden, the Raspberry Pi enthusiast's world looks a whole lot more interesting. **mm**



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The World's Most **Expensive** Software **Errors**

Coming on the back of some recent revelations regarding software in cars, Mark Pickavance looks at the errant software that cost companies millions

The power of software is that it's a flexible component, able to be adapted quickly to meet new requirements and challenges. But as much as that malleability is a strength, it's also a weakness, because often changes can occur rapidly and without sufficient testing before they're deployed. Sometimes this can cause inconvenience, but on occasion it can also be horribly expensive for the company involved.

Here, for your delectation, are some of the worst software blunders ever and their estimated financial impacts.

EDS Child Support

The lamentable track record of the public sector in the procurement and implementation of IT systems is astoundingly bad, but even by these remarkably low standards, the system that EDS created for the Child Support Agency (CSA) became the poster boy for bad government software development.

A modicum of blame must go to the department of Work and Pensions, which decided to entirely restructure its operations at the same time as EDS decided to roll out its new CSA system.

It appeared that no one had considered that the interactions between these two departments would no longer work, as their systems became entirely incompatible. The CSA system was worst

affected, having at one point some 500 documented bugs and many more left undocumented. It ended up allowing the CSA to overpay 1.9 million people, while underpaying a further 700,000 and resulting in more than £5 billion in uncollected child support payments.

During this period, the CSA had the highest number of public complaints annually by some considerable margin, as it failed to support those in need of support or to effectively pursue those who needed to pay it. It was eventually admitted that the CSA spent £1 for every £1.85 that it managed to get paid in spousal support, while running a backlog that reached more than 240,000 cases at one point.

A huge amount of money was never recovered, and the CSA system cost more than £1 billion of taxpayers' money, and yet it couldn't cope with the simplest changes in circumstances that people would commonly encounter.

A divorced friend once recounted to me something he was told by a CSA case worker on the phone. She told him categorically not to tell her if he patched up his marriage, because placing that information in the system would mean his records would be entirely inaccessible, possibly forever.

Eventually the role of the CSA was taken over by a new department, the Child Maintenance and Enforcement Commission,

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and a new system was commissioned for it to do the work that the EDS one gloriously failed to allow.

The 'Child Maintenance Service' is on track to be delivered in 2017/18, though the National Audit Office has already voiced concern about cost overruns.

Initially budgeted at £149m in 2011, that figure was up to £275m in 2012 and again to £352m in 2014. A total figure of £950m is now predicted, though this might become the second billion spent on this problem by the time it's complete.

Scandinavian Airlines Flight 751

In late December 1991, 129 passengers and crew boarded a Scandinavian Airlines McDonnell Douglas MD-81 in Stockholm. Their destination was Warsaw via Copenhagen, and while it was a typically cold day at the airport, there was nothing especially unusual about the conditions or flight.

In command was Danish captain Stefan G Rasmussen, aided by Swedish first officer Ulf Cedermark, a very experienced team of aviators. But after just 25 seconds of flight, they realised that their aircraft was seriously in trouble, after both engines began to make loud banging noises.

What was later determined was that as Flight 751 had sat outside overnight, the very low temperatures had chilled the fuel in the wing tanks, causing a substantial layer of clear ice to form on the wings – ice that two de-icing cycles had failed to shift. When the aircraft rotated at lift-off, the wings flexed, cracked the ice, which was then ingested by the MD-81's engines, which are mounted on the rear of the fuselage.

The noise coming from the engines is indicative of compressor blade stall, where air flows in the wrong direction through the engine, creating repeated bangs very much like an old car backfiring.

Instinctively, Captain Rasmussen closed the throttles to reduce the amount of air and fuel (and ice) that the engines were attempting to ingest as per his training, in the hope that the problem would clear. Under

normal circumstances this would have worked, as the engines are designed to handle ice and rain being sucked into them during normal operations.

However, what he didn't know was that McDonnell Douglas had made a software modification to the MD-81, to address a perceived problem with pilots throttling back on their climb away from the runway to reduce the environmental impact.

The software system, called ATR (Automatic Thrust Restoration), promptly moved the throttle back from where they'd originally been set, causing the engines to completely destroy themselves before Flight 751 had been airborne for 80 seconds.

At this time, the plane had only achieved a height of 3,220ft – insufficient to consider turning back to the runway.

66 The aircraft was totally destroyed and 100 passengers and crew suffered mostly minor injuries 99

With no power and no runway, only the amazing skills of Rasmussen and Cedermark managed to bring their stricken aircraft down through a pine forest and into a frozen clearing without any loss of life. The aircraft was totally destroyed and 100 passengers and crew suffered mostly minor injuries during the crash, which broke the fuselage into three pieces.

A later investigation cited the failure to remove ice and a software modification that the airline SAS appeared not to be aware of, which it therefore hadn't trialed its pilots to consider during an emergency.



Photo: Tomma Lakemaker (Werner Dick Fish Collection)

No price has ever been put on this incident, but the number was substantial when the cost of replacing the aircraft and the various personal claims were assessed.

Sadly, Captain Rasmussen felt unable to return to duty due to the physiological impact of these events and has not piloted an aircraft since.

Pilots are now trained to realise that ATR might countermand their throttle settings on this aircraft if they're forced to divert from their normal flight departure profile.

Mars Climate Orbiter

The Americans love imperial measurements, even if the people that devised them moved to metric some considerable time ago. Because of this, they often make horrendous mistakes when converting from one standard to another, and they often need to do this because almost everyone else uses metric, because it's easier not to mess up.

A very good example of this was the Mars Climate Orbiter. Launched in December 1998 on a Delta II 7425 launch vehicle, it arrived on Mars approximately ten months later, after a journey of 669 million kilometres.

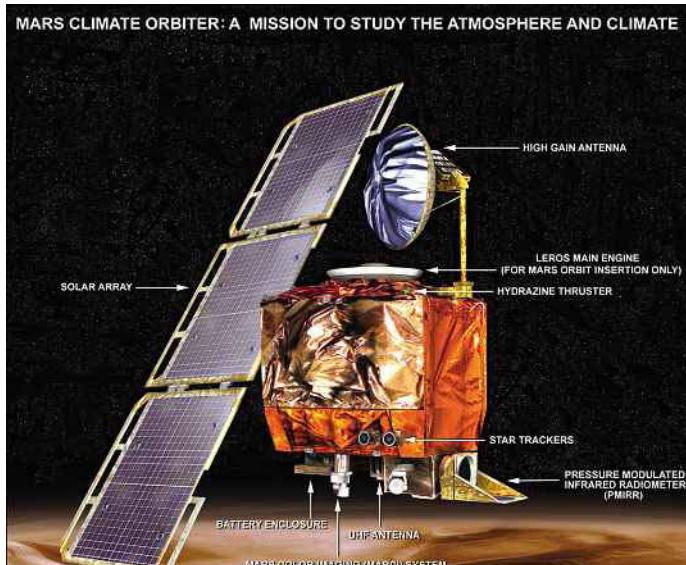
At this point, it was meant to execute a final big engine burn to insert the orbiter into its initial orbit of the planet, ahead of surveying the unique weather of the red planet.

Unfortunately, Nasa got a hint that everything wasn't perfect when the spacecraft passed behind Mars 49 seconds before it had assumed it would, losing contact, and then it didn't emerge on the other side.

A later investigation determined that the software written to control the orbiter's thrusters had been programmed with pound-seconds force (lbf-s) instead of the specified metric units of Newtonseconds (N-s). This resulted in it being significantly closer to Mars than it should have been, and instead of being caught by the gravity of the planet, it ploughed straight into the upper atmosphere and was promptly vaporised.

The cost of developing the probe, an associated lander and manning the mission was \$327.6 million, with no appreciable scientific return on that investment other than to be a footnote in the annals of poor software development control.

Lockheed Martin was responsible for the module that produced results in pound-seconds force, contrary to the software interface specification, and those numbers were handed to a Nasa written routine that was following the right specifications.



What annoyed many on this disastrous project was that two of the navigation team, who had noticed that the spacecraft wasn't tracking as it theoretically should, had raised concerns, which were then ignored.

Ariane 5 Flight 501

You'd think that the European space agency might have learned a few lessons from Nasa's Mars experience, but apparently it didn't. In 1996, on the brink of offering a large payload space transportation service, ESA fired its biggest space transporter from its launch facility in French Guiana. The huge Ariane 5 lifted off from the pad majestically, and just 37 seconds later the rocket exploded, taking a £500 million satellite payload with it.

“Failure with launch vehicles isn't exactly unknown, and with the energies involved, the results of a minor fault can often be catastrophic”

Failure with launch vehicles isn't exactly unknown, and with the energies involved, the results of a minor fault can often be catastrophic. Initially, engineers looked for a manufacturing fault or a component failure that might account for such complete failure. In the end, it was determined that the flight control software was the culprit, when it tried to force a 64-bit word into a 16-bit memory address. In doing so, it crashed the engine control software module. Luckily for the launcher, a backup system was available and took over controlling the engines. Regrettably, it had exactly the same coding fault, and crashed also.

With buffers overflowing in the code, the engines were commanded to deliver more than 100% of power and complied by converting Ariane 5 Flight 501 into a billion tiny pieces of scrap metal floating down over the Atlantic Ocean.

Curiously, this code was unchanged from the previous Ariane 4 design, the only difference being the level of engine output.





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With less power, the Ariane 4 never produced a number that was larger than 16 bit and therefore never crashed the management module.

The cost of developing the vehicle was \$8bn, and due to this error and other problems, it took three attempts to get one that didn't just explode like the world's most expensive firework.

Intel Pentium FDIV

Given the complexity of chip design, that they're not perfect from the outset isn't that surprising. That's why they go through various engineering revisions before being released to the public. However, Intel has had a number of major mistakes make it outside its labs, and the biggest one came in 1993 when it launched its flagship replacement for the highly successful i486 the Pentium.

On previous designs, Intel had segmented the floating point engine into a separate chip, but on the Pentium the hardware was all in a single die. But somehow in the process to combine the two components at chip level, something went awry in the microcode, and the floating point engine lost the ability to divide numbers correctly.

Some of the first people to notice this were those who used spreadsheets, who discovered that accounts that previously balanced no longer did.

At this time, probably the two applications that PCs used the most were Microsoft Excel and Lotus 1-2-3, so the importance that these machines should be able to calculate accurately was paramount.

Unhappy that they got shiny new Pentium machines, only to be forced to dig out their old i486, affected customers soon let Intel know of their displeasure. Eventually, unable to handle the widespread public backlash, it agreed to replace any defective chips with ones that could perform division to customers' satisfaction.

The cost to the company was \$475m at the time, which translates to \$783m in 2015 dollars. That said, in 1993 only 152 million personal computers were sold, but just ten years later that number was north of 600 million, the majority of them using Intel chips or its licensed technology. Therefore a bug of this type now would have a bigger impact on Intel, which has been roundly trumped in the tablet and phone markets by other chip makers.

BlackBerry Blackout

It's easy to forget that when President Obama came to office, he was probably the most famous BlackBerry user on the planet. Where Apple had success with a certain personal sector, BlackBerry was seen as a more appropriate tool for those in business.

It was a combination of two features that made Research In Motion (RIM, now known simply as BlackBerry) desirable for the business community: the full keyboard and the 'push' communications system. That second aspect was critical for BlackBerry users, because getting critical information long before others can be the difference between succeeding and failing in many markets. And with 'push', BlackBerry people always got the good (or bad) news first.

But RIM's greatest advantage also became its undoing in 2011, when its worldwide push communications network suffered total failure and didn't return for four whole days. What became very apparent during this prolonged outage was that RIM didn't understand what the problem was or how to fix it. This undermined its credibility severely, and by the time the issue was resolved its reputation was all but trashed in the business world.

“ After days of complete silence, RIM eventually offered the excuse of a ‘core switch failure’ ”

The outage originated in RIM's datacentre in Slough but soon spread to the Middle East and Africa, and eventually progressed domino-like to Latin America, the US and Canada. Eventually, three-quarters of the 70 million users couldn't communicate using the BlackBerry messaging service or even receive email.

After days of complete silence, RIM eventually offered the excuse of a 'core switch failure', the language of which tried to calm the anger of its most valued customers. For whatever reason, it decided never to elaborate on that, and in many respects this was as much a communications failure as it was a software-based fiasco.

By way of compensation, BlackBerry customers were offered \$100 of free applications for their phones, but the damage done to the brand couldn't be fixed by token gestures.

At the time this happened, RIM was already coming under pressure from both Apple and Android, and the blackout only accelerated its market share decline. That it's now on the verge of launching its own Android phone is a demonstration of how its fall from grace is almost complete.

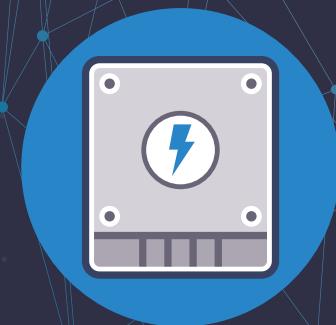


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Knight Capital Group

Trading on the stock exchange can be a risky business, because a breaking news story can wipe the value off stock very rapidly. But a distant event wasn't the problem that Knight Capital Group had to contend with, when in 2012 its automatic trading software ran entirely out of control.

The trading day in New York started like any other, until at 9:30am EDT the software started to react in a way contrary to its usual logic. It decided that buying high and selling low was the new business model it would follow, and it started pushing these sorts of transactions through 150 different stock channels.

As a result, KCG managed to blow \$440m in the next 30 minutes before it pulled the plug – four times the net income for the business in the previous year and nearly twice the market capitalisation of the company.

It's been estimated that the code glitch led to four million extra trades in 550 million shares that would not normally have existed.

The software issue here was a routine called 'Power Peg', which was actually designed to test the software's effectiveness at tracking a stock movement by artificially moving it up or down in the test environment. The flag for this was repurposed by one of the coders, forgetting that Power Peg routines still existing on the servers would read it and act accordingly.

The result was that the Knight Capital Group's own stock value was devalued by 75% and resulted in the company being acquired by Getco LLC some months later by mutual agreement.

Many in the stock trading capitals of the world are concerned that automated trading will eventually cause a complete collapse of the world's markets. And what happened to the Knight Capital Group only fuels the suspicion that a simple coding error might cause commercial chaos if allowed to go unchecked.

Heathrow Terminal 5

Anyone who's travelled through an airport will soon realise that they're very prone to single point of failure scenarios. Accept it or not, they're like factories where the travelling public and their baggage is loaded at one end, and happy destinations are supposedly waiting at the other.

Obviously, new airports get to avoid the mistakes of the past – or so you'd reasonably think. That logic certainly didn't apply to Heathrow Terminal 5 when it opened in March 2008 for the exclusive use of British Airways.



How 3D-printed rats could offer schools a vegetarian dissection

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A fresh take on technology

Not long after the Queen had officially opened it for business, it became apparent that the new terminal wasn't working as planned, specifically in the area of baggage handling.

The software that had worked flawlessly in testing became unpredictable when confronted with typical scenarios where checked-in luggage needed to be retrieved prematurely because it contained something critical, like passports or medication.

It eventually collapsed completely, and over the following ten days of operation, approximately 42,000 bags failed to travel with their owners, and some 500 flights were cancelled entirely.

These problems delayed the transfer of British Airways' long haul flights to the terminal and forced the company to spend on an advertising campaign to reassure the travelling public that the flaws had all been addressed. Those who travel through Heathrow on a regular basis might still contest that claim, I suspect.

The total cost of the mostly software-based problems that beset Terminal 5 have never been made public, but they probably run into tens of millions at the very least.

VW Emissions Testing

By any strict definition, the software that VW deployed in its diesel cars wasn't faulty, from what we know. And, as they say, that's really the crux of the problem.

This story, as all the best ones do, has some legs that take it back a couple of years and involve a non-profit organisation called the International Council on Clean Transportation (ICCT). It set out to bang the automotive drum about 'clean diesel' cars (if that isn't a contradiction in terms) and chose to do this by working with some emissions researchers at West Virginia University.

They took three popular vehicles – a VW Jetta, a VW Passat and a BMW – which they tested in the lab and on the road for their emissions. Disturbingly, only the BMW passed the tests, and there was a huge discrepancy (40-fold on occasion) between what the VW vehicles achieved on a rolling road and a real highway.

As it's legally bound to in the US, ICCT reported these findings to the EPA and the California Air Resources Board (CARB), both of whom approached VW for an explanation.



According to various sources, VW initially blamed the problem on a software bug and promised to fix it immediately with a voluntary recall.

Subsequent testing revealed that it wasn't just these but other VW and Audi cars that exhibited this odd behaviour, and a year later they still did. Eventually, tired of VW's prevarication, CARB declared that it wouldn't be passing 2016 models to be sold, at which point the truth came out. VW had designed a 'defeat device' that could work out if the vehicle was actually driving or on a rolling road, by checking if the steering wheel was being moved.

“ VW shares have dropped nearly 60%, as shareholders have tried to assess the impact ”

If the vehicle sensed that the wheels were rotating but no steering input was being detected, it would enter a special testing mode, where it would run the catalytic scrubber up to full power. The downside of doing this is that it drastically affects both performance and fuel consumption, undermining the whole ethos of owning one of these 'fuel efficient' vehicles.

Subsequently, VW admitted that nearly half a million cars in the US and 11 million worldwide had this system for cheating emission tests, and the consensus is that it isn't the only car maker who's been doing this.

What's mildly hilarious about this story is that when it broke, the head of the VW US business, Michael Horn, said, "we totally screwed up". Er... no Michael. Screwing up is when you go to the supermarket and come back without eggs, whereas in this instance you set out to defraud your customers and emission control agencies, while intentionally damaging the environment. And you succeeded in this venture for about six years.

The Audi A3 and VW brands Passat, Beetle, Golf and Jetta are all affected.

An insurmountable problem for VW in this instance is that if it was just one division of its company affected, it could claim a rogue team or designer, but as this tech turned up in the Audi division too, it was clearly something that was managed at a much higher level.

The financial implications of this software choice are quite mind blowing and could potentially bankrupt the company – at this time the world's largest car maker.

There are 482,000 vehicles in the US that carry the defeat mechanism, and under US statutes, VW could face a fine of up to \$37,500 per vehicle, which would hit it in the wallet to the tune of \$18bn. However, that doesn't take into account fixing those vehicles, or any claims made against it for environmental damage and by the car owners. And it also doesn't include any of the approximately 10.5 million cars outside the US and how those owners and countries will react to these disturbing revelations.

VW shares have dropped nearly 60%, as shareholders have tried to assess the impact of these additional costs, which might wipe out profitability for some years to come. When the final bill for this comes in, if VW doesn't vaporise under the legal barrage in the meantime, it will probably turn out to be the most costly software mistake ever made.

That said, it's entirely possible that another company has done something even more horrendous, which we just haven't heard about yet... **mm**

Component Watch

Looking for a keyboard to make your gaming more comfortable? Try one of these...

Last week, we looked at gaming mice, so the best way to follow that up is with a look at gaming keyboards! It's possible you don't see the appeal of these high-fidelity devices, but trust us, serious gamers will feel the difference between a cheap keyboard and one of these. And if nothing else, why wouldn't you want a keyboard with a backlight? Pick your favourite device from this list, and you're sure to get the best prices we could find for it.

Deal 1: Cooler Master CM Storm Devastator

RRP: £39.99 / Deal Price: £25.49

If you want an all-in-one gaming solution, the Cooler Master CM Storm Devastator is a gaming mouse/keyboard pack, which acts as the perfect entry-level set of gaming peripherals. Anti-slip surfaces and grips, blue LED lighting and ultra-durable keys and buttons make it ideal for gamers who want to dip their toe into high-end peripherals without the associated cost.

Where to get it: Scan – bit.ly/1NhiALT



Deal 2: Corsair Gaming K30

RRP: £49.99 / Deal Price: £39.95

Corsair may be better known for its RAM than keyboards, but that doesn't mean this one isn't a strong contender; Corsair's gaming credentials are second to none, after all. Features include adjustable brightness LED backlighting, six programmable keys, game-optimised anti-ghosting, on-board profile storage and multimedia keys. The WASD keys even light up so you can find them easily in the dark, which is a great touch.

Where to get it: Overclockers – bit.ly/1Ms6JYI



Deal 3: Logitech G105

RRP: £54.99 / Deal Price: £49.49

It's not the most expensive gaming keyboard around, but Logitech's mid-range effort includes a lot of features, including

LED backlighting, six programmable keys, an instant mode switch and a set of media keys. Six key ghosting is also included, as well as the ability to disable standard function keys like the Windows and right-click buttons. For less than £50, it's a steal!

Where to get it: Maplin – bit.ly/1jqCWc9



Deal 4: Razer BlackWidow Tournament

RRP: £65.95 / Deal Price: £59.95

Designed specifically for tournament gaming, the Razer BlackWidow Tournament has fully mechanical switches which actuate at an optimal distance for speed and responsiveness. Each key is good for 60 million strokes, and there's a detachable USB cable, 10-key anti-ghosting and fully programmable macro key recording to give you access to a truly advanced gaming experience!

Where to get it: Overclockers – bit.ly/1G7FaHv



Deal 5: Gamdias Hermes

RRP: £89.99 / Deal Price: £76.82

The most expensive keyboard on our list, the Gamdias Hermes is packed with features, including special quiet mechanical keys, 512KB of on-board memory and a built-in USB passthrough port. That's in addition to all the other things you'd expect from a gaming keyboard at this end of the market: backlighting, 13 macro keys, magnetic detachable wrist rest and 10-key anti-ghosting. The included wrist rest even works as a dust cover! A must-buy for any serious gamer, especially at this reduced price.

Where to get it: Ebuyer – bit.ly/1LQ6EU





Watercooling From Germany Comes To UK

[Overclockers now selling products from
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Microsoft Launches New Lappy

Macbook-beater?

Microsoft is taking on the Apple Macbook with the launch of the Surface Book laptop. The launch was part of yet another Microsoft press event where it was, unsurprisingly, the big announcement.

The laptop – Microsoft's first ever – is very much a real attempt to take Apple on with a 13.5inch PixelSense touchscreen display (3000 x 2000 resolution) running the Windows 10 Pro operating system and housing a 6th generation Intel Core i5 or i7 processor alongside either 8GB or 16GB RAM while also boasting up to 12 hours battery life. A Surface Pen is included too so this is a bit of a hybrid – the screen is detachable so can be used as a tablet in its own right – and the idea, at least Microsoft hopes, is that this could very well be the saviour of the PC market.

It's going to cost an Apple-esque price too, priced at \$1,499, which is around £1,000 in good old English pounds, although we don't actually know the UK price as yet. Microsoft is claiming that this is the fastest 13" laptop ever made, which is perfectly possible of course, although we'll wait until it's been tested in

the field before commenting any further. It does at the very least mark out a next chapter in the ongoing battle between the Windows and OS X/iOS eco-systems.

Innovation, power and a computing solution for all. Sounds, and looks, good on paper. Your move, Apple.

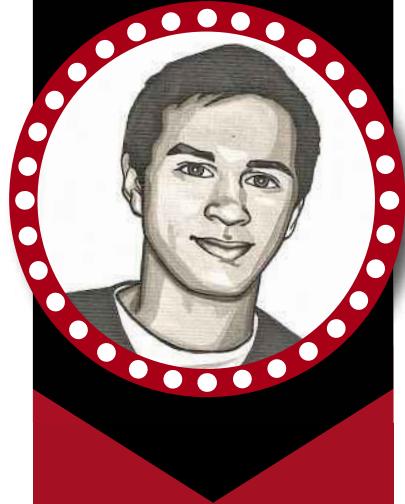


Overclockers UK is the first UK supplier of Raijintek's Atlantis large range of watercooling products.

There are three waterblocks – pictured here – for CPU, GPU and VRM, all designed to fit the latest-gen platforms from AMD, Intel and NVidia. User friendly for installation and easily fitted for the user's hardware, the waterblocks are copper and have a 3D micro-structure glow tunnel inside,

enabling better heat transfer. As well as the waterblocks, Raijintek offers pumps such as the RAI-PM5, a high level solution for enthusiast and PC builders, and the RAI-R10 tube reservoir made from thermoplastic that's durable and lightweight.

The company also provides coolants including anti-freeze and watercooling tubing designed to resist twisting and collapsing. So www.oclockers.co.uk is the place for more details.



As a person involved in a creative industry, I'm all too aware of the need to get paid for my work, so I can completely understand why some websites would want to use a paywall. But when it comes to free content on the web, the genie is well and truly out of the bottle, and there's very little we can do to get it back in there.

The fact is that people have become accustomed to getting content for nothing, and there will always be someone willing provide it, albeit supported by ads. However, that doesn't mean there's no market for paid online content, because there are also plenty of people, like me, who hate ads and don't mind paying for truly exceptional writing and/or photography.

What I don't want, however, is to pay a subscription, because I like to pick and choose, just as I might get a newspaper one day but not the next. Certain providers don't get this, though, and want you to sign up to a running deal. That's fine for some, but I'd like to see more pay as you read deals too.

What do you think about website paywalls?

Anthony
Editor

Dell Agrees Biggest Tech Takeover

How much!?!

It's hard to believe, but there was a time when £100 was considered a lot of money. Nowadays, it's the spec of dust on a peanut compared with some of the vast sums being bandied about. Take Dell; the America-based computing firm has just announced that it's prepared to pay \$67bn for a data storage company, EMC.

If this deal is approved by regulators it will be the largest tech takeover in history, which is hardly surprising when you look at the figure again.

\$67bn! That's a wedge of cash that could buy you around 50 sports teams in the States, still leave you with plenty left to buy yourself a penthouse suite in one of America's very finest neighbourhoods.

For Dell, it's actually a move that makes a bit of sense, beyond just splurging some cash as showing off. The PC market ain't what it used to be, so it's going to have to look for new revenue streams if it wants to continue making

its shareholders rich, and data storage is a natural extension of its business. By appealing to its business customers, Dell could yet have a rich future ahead of it, although HP's CEO Meg Whitman has criticised the deal in an email sent out to employees.

\$67bn, though... Wow.



Meanwhile... On The Internet...

If any reminder was needed that security should be high on the agenda of every computer user, then figures released last week showing online crime as making up significant chunk of total recorded crime in the UK should be it. In fact, the first ever inclusion of cybercrime statistics in the UK's overall figures (tinyurl.com/MMnet85a) was part of an unprecedented leap of 107% in the number of reported crimes, unsurprisingly considering it accounted for 2.5m reported offences that fell under the Computer Misuse Act (tinyurl.com/MMnet85b) out of a total of over 14 million, another 5.1m of which were fraud-related (with a worryingly significant 1/3 of those being perpetrated on pensioners: tinyurl.com/MMnet85c). Interestingly, though, that number may still only be the tip of the iceberg, due to the controversial way the statistics were collected (tinyurl.com/MMnet85d) via a "large scale field trial" of 2000 households (tinyurl.com/MMnet85e).

Louise Pordage, Senior Manager in KPMG's Cyber Security practice, was quoted by NetImperative (tinyurl.com/MMnet85f), as saying: "While the figures released today may appear high, I am certain that cyber crime remains one of the most under reported areas in our crime statistics. There is little clarity around the impact of cyber crime against the UK economy, and of course the statistics released today only consider crimes against the person rather than corporate crime."

That's an interesting (if scary) point, in a week where news also broke of a massive cyber attack that lifted an estimated £20m (though that figure was described as "conservative" by the National Crime Agency) from the coffers of UK banks. It appears to have been perpetrated by eastern european criminals using the Dridex malware (also known as Bugat and Cridex) to scoop up access details for UK bank accounts (tinyurl.com/MMnet85g). However, rather than targeting individuals in a way that would be reflected in the Office Of National Statistics crime figure, that software-based fraud distinctly targeted financial institutions, and may have netted those responsible as much as \$100m worldwide thus far (tinyurl.com/MMnet85h). One arrest has been made in connection with the fraud, though, a Moldovan by the name of Andrey Ghinkul (aka Andrei Ghincul/Smilex) who was recently arrested in Cyprus, and whom the US is hoping to extradite to face charges there.

If you really want to make yourself depressed about the state of cyber security, though, you should read the report (tinyurl.com/MMnet85i) stating that as many as 85% of all Android devices have been vulnerable to one of 13 critical flaws found in the operating system (tinyurl.com/MMnet85j).

.AVWhy?

Videos For Your Eyes...
Not Necessarily For Your Brain

Mjölnir, the hammer wielded by Thor, has become an internet meme of its own in the last few years. There are videos to explain how its pronounced (tinyurl.com/MMnet85r, and tinyurl.com/MMnet85s), and endless debate about its properties and what makes one 'worthy' to wield it (tinyurl.com/MMnet85t and tinyurl.com/MMnet85u). It was an issue that became an interesting aside in *Avengers: Age Of Ultron*, but YouTuber and Cosplay enthusiast Sufficiently Advanced seems to have taken Tony Stark's cynicism to heart when creating his electromagnetic version in real life, which only responds to his fingerprint (tinyurl.com/MMnet85v).

It would seem, at least according to reports by Torrentfreak (tinyurl.com/MMnet85n) the BBC is clamping down on VPN access to its iPlayer service (tinyurl.com/MMnet85o), which it no-doubt hope would lead to a reduction in the 60m or so users that apparently access the service from abroad despite not paying for it via a license fee or any other means. While the BBC has gone out of its way to deny it's targeting these users (and, in fact, refutes that number: tinyurl.com/MMnet85p) it has said it "We regularly make updates to our technology to help prevent access to BBC iPlayer from outside the UK which breaks our terms of use", and has said that it will "seek to ensure users of private VPNs such as those used by schools and companies in the UK have access." That, however, will probably have a knock-on effect on UK users who routinely use a VPN service for reasons of privacy.

While the Beeb has refuted that it is cracking down on access for expats and foreign users, it is a measure that would make sense considering its stated aim of increasing revenues from the sale of its shows in foreign markets, a strategy it announced when closing its Global iPlayer subscription service in June (tinyurl.com/MMnet85q). What's more likely to happen, though, is that its efforts will lead to an arms race where VPN services seek to circumvent any new BBC measures as quickly as they can manage for fear of losing lucrative business. Indeed, mere hours after the Torrentfreak report, some services (no doubt keen for the publicity) were already declaring that iPlayer was available again with their software.

A team of researchers from the University of Cambridge came up with the number after trawling through the data collected from 21,000-odd users of the app, Device Analyzer (tinyurl.com/MMnet85k) to create a so-called FUM Score to grade manufacturers on how fast they patch flaws (see how your phone's manufacturer fairs at: tinyurl.com/MMnet85l).

Most worrying, though, is that the research seems to show that the situation is getting worse, not better. It seems the number of vulnerable devices was less 40% in early 2013, so the percentage has now more than doubled – a function, no doubt, of heightened targeting of Android devices over that time as well as update inconsistencies amongst makers.

And let's not even talk about ever-vulnerable Flash, if you don't mind (tinyurl.com/MMnet85m). It makes us want to cry, to be honest.



Caption Competition



This chap and his timepiece were the stars of Issue 1383's caption competition, and here's what you came up with:

- **Thomas Turnbull:** "Bought a phone with an alarm clock function from eBay and just look what they sent me."
 - **wyliecoyoteuk:** "The cuts at the Greenwich time service have bitten deep."
 - **wyliecoyoteuk:** "Richard was having problems adjusting to the new alarm setting on his phone."
 - **doctoryorkie:** "...and that's how long a mobile stays fashionable for."
 - **doctoryorkie:** "21st century old timer."
 - **Boris:** "There must be easier ways to get a new ringtone?"
 - **JayCeeDee:** "I'll just set both alarms – don't want to miss The Apprentice!"
 - **The VFM Addict:** "Bob was shocked that the PPI telesales people were still working and calling him at ten past four in the morning."
 - **Dennis Graves:** "Overclocking his phone proved more difficult than Dave was expecting."
 - **Leigh Spriggs:** "Upon hearing his agent has found a buyer for his new clock-inspired work of art, Jimmy the artist says, 'Good. It's about time.'"

This week's winner, though was The VFM Addict with "The girl on Snapchat didn't want to see his clock", which didn't half make us larf. Of course, if you don't agree, there's only one thing to do, really: prove you're funnier. So why not head over to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**) and by caption the picture below – or email us your funnies via **caption@micromart.co.uk**, remembering to add the issue number to the email title.



Gaming Industry Given Boost

Government promises £4m to firms

The UK government has recently introduced the Video Games Prototype Fund, a £4m investment in the industry that is intended to help give small gaming firms a helping hand on the way to creating successful products, while also creating jobs. It's aimed at starter firms looking to create

prototype software, and it will work in practice by providing individual grants of up to £25,000 for approved projects over the next four years.

Some projects will then be given a further £50,000 to help them develop beyond prototype stage and the idea, in the government's own words, is to help "kick-start the next *Tomb Raider*."

BBC Airs E-Gaming Event

League of Legends comes to the masses

Auntie Beeb has shown some love to the e-sports industry by streaming live coverage of the quarter finals of the League of Legends World Championships from Wembley Stadium. As well as live streaming the quarter finals on its website, BBC Three also aired highlights in a move that's testament to how

big e-sports has become in the last few years. It's also, we should add, testament to the breadth of programming that the BBC is prepared to support.

Teams from around the world will be taking part in the event and the winning team of the whole thing – the finals themselves will be held in Berlin on 31st October – will bag \$1m.



Snippets!

Fujitsu TNMOC Support

The National Museum of Computing at Bletchley Park has itself a Foundation Sponsor in Fujitsu. What that means in practice is that it's a valuable, big-name sponsor to allow the museum to further develop itself as one of the world's top computing museums.

The Chair of TNMOC said of the move: "Fujitsu's generous sponsorship of the Museum is inspiring. Fujitsu's role in conserving British computing heritage has been exemplary. Its archives have contributed significantly to our displays of early British computing that today attract great interest."

Robophones?

When Sharp is at the design desk, apparently phones can also be robots. Yes, the company has announced a smartphone that is also able to dance for you as well as responding to your voice and displaying videos from its face. The 20cm-ish phone/robot hybrid is going to be known as RoBoHoN, and will go on sale next year.

Bizarre, totally unique and really quite futuristic, it sounds pretty cool. We can't imagine the looks you'll get if you pull this one out on the bus, however.

Facebook's Tiny Tax Bill

Anyone reading that's unhappy with how much corporation tax big business pays in this country? Look away now. According to media reports, Facebook paid a little over £4,000 – £4,327 to be precise – in corporation tax last year, with its UK tax information confirming the fact.

While it didn't pay a lot of tax – and that's an understatement, if ever there was one – Facebook did pay out big in share bonuses – £35.4m, actually. That works out as £96,000 on average per UK Facebook employee. It's not a bad company to work for financially, actually, with the average salary for its UK employees standing at £26,500.

Bug Bounty For Google Domain Owner

Famous for 60 seconds, rich for a wee bit longer

On September 29th, Google – at least for a brief moment – wasn't in control of its own domain name. A student called Sanmay Ved was instead left in control of **Google.com** for a single minute, as an admin error meant that he was allowed to buy the domain name. He

was browsing sites on Google's domain-selling service at the time and noticed Google.com was up for grabs. He paid the \$12 fee and... job done.

Naturally, the offer was rescinded and Ved was refunded once the error was realised – quickly realised, too – and all was well again. Having spotted the error,

Veb has been rewarded by Google's bug bounty system with what's been described as a "cash reward". Veb, very kindly, is going to give that money to charity.



Banned In The UK: Balance Boards

McFly!

You may have noticed that in the cities of the UK, an uprising has begun. An uprising involving hoverboards, though not like those seen in *Back To The Future II*, unfortunately. The hoverboards of which we speak now are really little more than low-lying balancing scooters that look – at a glance – like a handlebarless Segway.

While they seem to be blossoming in popularity, it's now been confirmed that they are completely illegal to ride on Britain's roads and pavements, too. In fact, the Met Police issued a statement earlier this month to remind users that, like

Segways, they are forbidden from being ridden on our streets and roads as they don't meet the requirements for roadworthy vehicles.

This will be a bit of a problem for gadget shops, which have been selling the devices of late, and also for the consumers who may have bought the scooters from them in good faith that they'd be able to whizz around them on their village streets. Thing is, they've always been illegal – the Met Police was just reminding people of the fact, no doubt because it's seen more and more of them doing the rounds of late.

Christmas, for some young 'uns, is cancelled!

Voice Actors Vote To Strike

Gaming industry to feel the pinch?

So it finally happened... The Screen Actors Guild – American Federation of Television and Radio Artists (SAG-AFTRA, as if that's much easier) has overwhelmingly voted to go on strike.

A huge 96% of its members voted in favour of the action, which all revolves around their pay – specifically that they aren't getting enough of it. The voice actors are looking for royalties for

the frightfully-successful games they lend their vocals to. They're looking for assurances outside of pay too, requesting stunt co-ordinators for motion-capture shoots and special payment for recording sessions that are stressful on the vocal chords.

With this strong show of support for strike action, the body can now go back to the negotiating table so that actors can hopefully get the demands they want.

AI System Takes IQ Test...

... And does pretty well

Some clever chaps over at America's MIT (Massachusetts Institute of Technology) have put an AI system through its paces by letting it take an IQ test. The MIT Review published the results, and it turns out that the system designed by the team did... alright, we suppose.

The system – ConceptNet 4 – was tested on a typical IQ test found in US schools

that looks at intelligence in a number of areas. These included vocabulary, word reasoning, comprehension, similarities and general information questions, and it effectively managed to perform at a level equivalent to that of a four-year-old.

The fact that the system did so well should do a good job of fuelling fears that sometime soon, the robots could take over!

Netgear Exploit Found

Hacker attacks

Poor old Netgear. No firm likes to make headlines for all the wrong reasons but that's exactly what was facing the network specialist after a security researcher in the States said his router was hacked.

The BBC reported that the router was hacked in order to send browsing data to a malicious web address, with the

Domain Name System settings having been altered. Netgear has reacted by admitting that, yes, there is a problem but no, it really doesn't affect that many routers – less than 5,000, in fact.

The affected researcher's advice was to turn off the router for a while until the bug was fixed, which should have happened by the time you read this.

Man Plays Minecraft For 35 Hours

Toilet breaks allowed

In the world of *Minecraft*, the UK has a new king. Joe Kelly from Cheltenham played the game continuously for 35 hours, 35 minutes, and 35 seconds in order to raise money for cancer research, and he's submitted the evidence to the Guinness World Record bodes as this is a record for the longest continuous game of the block-building behemoth.



Synology DS215+

Mark investigates if the DS215+ is the fastest small NAS box yet?

DETAILS

- Price: £281 (Ebuyer)
- Manufacturer: Synology
- Website: www.synology.com
- Requirements: SATA hard drives or SSD in 2.5" or 3.5" formats, wired network



Synology's number versioning isn't as easy as it once was, since it stopped releasing a baseline year model and then the budget and performance derivatives above and below it.

Therefore, with the DS215 range there is no Value Series model, just the budget J Series DS215j and, reviewed here, the DS215+. The equivalent Value Series machines are the DS214 and DS214Play, and this is a different beast to those other dual-drive NAS solutions.

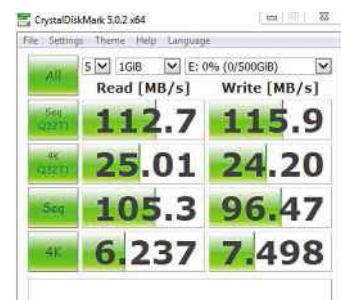
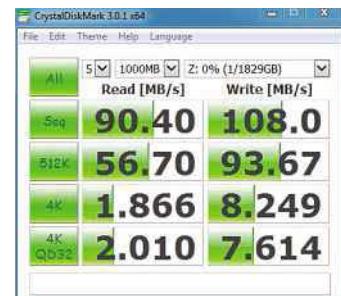
At the heart of this unit is the Annapurna Labs Alpine AL-212 processor, a 1.4GHz dual-core ARM Cortex-A15

SoC that has built-in RAID functionality. As this is only a dual-drive NAS box, it can't really do both redundancy and performance striping, but combined with the 1GB of RAM, there's plenty of

performance to push two SATA mechanisms, with a maximum of 16TB of total capacity based on the largest SATA drives currently available.

Externally there's an eSATA port and two USB 3.0 ports, so it's possible to expand the storage further through external storage if you need that.

For those unfamiliar with Synology's DSM operating system, this is the veritable Rolls-Royce of embedded NAS solutions that now has a vast collection of installable applications. Using these, you can use the DS215+ for a widest range of tasks – everything from being a firewall to a mail server, or even a surveillance camera image/video repository. It's customisable in a way that others just dream about.



The functionality here goes well beyond anything that Western Digital, Netgear or Seagate has at this time, and pricing of Synology hardware reflects that premium market position.

What's fascinating about the DS215+ is that while the traditional market for dual-drive NAS is the home, this hardware seems better orientated towards a small business. Supporting that view is the inclusion of dual LAN ports that can be aggregated using a channel-bonding Ethernet switch.

They can also be used in a failover mode, building resilience into the network infrastructure.

Typically, home users just won't use this type of technology or have the demands that necessitate it. But in this kit, it's exactly the key that unlocks some amazing performance.

For my testing I used two 2TB Western Digital Reds inside the enclosure and

DS215+ Specifications

- **CPU Model:** Annapurna Labs Alpine AL-212 dual-core 1.4GHz
- **System Memory:** 1 GB DDR3
- **Drive Bay(s):** x2 SATA (either 2.5" or 3.5")
- **Maximum Internal Raw Capacity:** 16 TB (8 TB HDD X 2)
- **External Ports:** 2x USB 3.0 Port, 1x eSATA port
- **Size:** 157 x 103.5 x 232 mm
- **Weight:** 1.69kg
- **LAN:** 1GbE LAN port x2 (with Link Aggregation / Failover support)
- **Wake On LAN/WAN:** Yes
- **System Fan:** 92mm
- **Power Consumption:** 20.77 W (Access), 8.96 W (HDD hibernation)
- **Warranty:** Two years



66 It's probably the best dual-drive NAS box available today 99

configured them in Synology hybrid RAID mode, and then accessed it using both CIF and iSCSI connectivity over my internal wired network.

Unfortunately, I don't have link aggregation at either the switch or the PC end, so I was forced to watch it entirely max out my single gigabit link.

Under CIF, it managed 90.4MB/s reads and 108MB/s

writes, and under iSCSI it really topped out available bandwidth at 112.7MB/s reads and 115.9MB/s writes. Read is normally quicker than writes, so I can only conclude that Synology configured the RAM to better service that side of the operation in this system.

Those are really excellent numbers, and Synology claims

that if you've got aggregation of the two LAN ports, it will deliver 209MB/s reading and 139MB/s writing speed under a RAID1 drive layout. Given the numbers I achieved on a single gigabit line, I've no qualms accepting these as wholly realistic numbers.

It's hard to be critical of such a small yet powerful design, though I think that with such power, more USB ports should have been included. If one is used for a backup and another to control a uninterruptable PSU, you've got none left. And at this time, Synology doesn't support USB hubs.

Other than that, the only other caveat is the price, which is a good bit more than even its excellent DS214Play. Once you've put some decent drives in here, the total price could be well over £600, depending on how much space you want.

For business buyers, I'd strongly suggest they consider spending the extra £55 that the DS718 costs, because that is not only even more

powerful, but can also accept the DX513 expansion box to grow the system organically from two drives to seven.

As for the DS215+, it's probably the best dual-drive NAS box available today, especially if you're prepared to get an aggregating switch to make the most of what it can do.

mm Mark Pickavance

The Bugatti Veyron of dual-drive NAS boxes



Myfox Home Alarm And Security Camera

Mark celebrates national home security month with a Myfox review

DETAILS

- Price: Security Camera £169 Home Alarm £249
- Manufacturer: Myfox
- Website: www.getmyfox.com/uk
- Requirements: Broadband wi-fi connection, deep pockets



If I was handing out accolades purely for design and style, the Myfox Home Alarm and Security Camera would be heading for glory. I can imagine Apple's Jonathan Ive would gush over them (if they had an Apple logo on them, obviously).

Starting with the camera, this is a gloss white and silver cylinder, about the size of a small French soft cheese box. It sits cleverly on a magnetic foot that allows wide range of vertical angles and is powered by the same micro-B USB connection that most phones use. It will also operate on batteries if the mains power is cut off for up to one hour.

But what makes this camera special is that when not in use,

it appears to be some elegant objet d'art, revealing the lens only when brought out of privacy mode. And other than the looks, that's the big selling point here, because in this increasingly paranoid age, we reasonably wonder who might watch us through our own technology.

The sliding door mechanism is elegant, like something from a movie, and even though the camera is only 720p, this is a high-quality sensor that provides

exceptionally sharp images in both night and day mode.

In terms of what it does, the Myfox Security Camera does it very nicely, even if some rather obvious features like panning are not part of its repertoire.

As you're probably expecting, the camera is accessible via a smartphone app (iOS and Android), so you can check on those at home while you're out shopping, and even have a conversation through a built-in microphone and speaker.

A motion sensor can activate the camera, or it can be set to record 24/7, sending the video feed to a cloud service that you can access remotely. The catch with doing this is that you only get this recording feature for £3.99 a month for 24 hours of continuous recording or £7.99 for week-long retention.

That seems excessive given the £169 cost, but

Myfox presumably thinks its technology is worth an ongoing financial commitment.

The Myfox Home Alarm system seems better value to this writer, even if it initially costs even more than the camera.

The system operates independently of the camera and is aimed more specifically at securing your home from intrusion by providing alerts and an alarm.

Styled like the camera, the biggest part of the kit is the siren, a sandwich-plate-sized device that contains hardware capable of making a genuinely ear-shattering 110db noise should the system conclude you are being invaded. Like the camera, it has a battery backup, so a power cut won't stop it alerting you.

Along with the siren, the alarm kit comes with an IntelliTAG door/window sensor, a special smart key fob, and a small wireless





I guess it all comes down to how concerned about your home and possessions you are, and if you can afford this, then they're probably worth protecting.

As much as I'm keen on the whole IFTTT (If This Then That) and Internet of Things technology, it needs to be more affordable than this to achieve wider acceptance.

While Myfox did an admirable job of designing these products, what they do is relatively simple in IFTTT terms, so they seem a bit limited for the high cost.

mm Mark Pickavance

Great looking technology that's just too expensive

“ It all comes down to how concerned about your home you are ”

Link device that connects all these features into the broadband wi-fi.

A big selling point of the door/window sensor is that it's they are intelligent, in that it can work out the difference between a ball hitting a window and someone trying to break in, sounding the alarm before the intruders get inside, hopefully.

Equally smart is the key fob, as it effectively tells

the system when you've left home, activating the alarm and disabling it on your return. That you only get one is a little disappointing, because unless you're a complete recluse you'll need at least two, I'd suggest. Once everyone has one, the phone app can also be used to remotely check who is home.

That phone software is rather critical, because you can use it to sanction access

to your friend's phone so they can deactivate the alarm to feed the cat or whatever.

And you can buy extra sensors and key fobs as you need them. Each tag is £39.99 or £169.99 for a pack of five, and each Key Fob is £24.99. You can also accessorise the camera with a magnetic wall mounting for £24.99.

A better aspect of the Home Alarm is that it isn't linked to a monthly subscription service, ring-fencing the cost. That said, a typical four-person family with a least a few doors and windows to protect could easily spend £500-600 – or more if they want a camera alongside the Home Alarm.



BenQ XL2420G Monitor

David checks out a 24" monitor that promises high-end gaming visuals

DETAILS

- Price: ~£350
- Manufacturer: BenQ
- Website: goo.gl/qtC9Xt
- Requirements: Compatible Nvidia G-Sync card for best results



▲ The BenQ XL2420G is a stunning monitor, with an excellent screen

The BenQ XL range of monitors has never ceased to amaze us in terms of quality, features, specifications and design. The higher end of the range, the XL2730Z, is one of our favourite gaming monitors of all time; however, today we have the next model down from that, the XL2420G.

The XL2420G is a 24" TN panel with a 1ms response time, 12,000,000:1 dynamic contrast ratio and a 144Hz refresh rate, complete with BenQ's Eye-Care capabilities and Nvidia G-Sync gaming enhancements. The 1920 x 1080 screen has an anti-glare and non-reflective coating and features BenQ's Ultra Low Motion Blur (ULMB) technology, while also improving the on-screen colours in-game with a 20-level Colour Vibrance setting.

Connectivity is nicely covered, with a pair of HDMI ports, DisplayPort and DVI. You'll also find a USB 3.0 two-port hub to the side, along with the push/pull-out headphone stand and audio/mic ports.

In terms of ergonomics, the XL2420G can swivel left and right 35°, tilt from -5° to 20° and pivot 90°. You can also adjust the height to a maximum of 130mm and drop the screen down so that it's perfectly flat with the base of the monitor.

Furthermore the central stand also incorporates a large cable tidy hole toward the bottom, and at the top there's a carry handle. The package comes with BenQ's XL-exclusive S Switch remote. This wedge-shaped extra, which can dock with the side of the base, has three mode buttons to select different gaming profiles and a wheel for tuning and selecting the input. The S Switch remote plugs into a micro-USB port underneath the monitor, thankfully not taking up one of the built-in USB ports on the monitor's hub.

The software side of the monitor isn't lacking in details either. Aside from the colour setting scales, there are preset gaming modes designed to output the best display when playing FPS, RTS and MOBA types games. Together with fine

tuning brightness levels and a Black eQualiser Dynamic Engine, and the fact that you can customise the display to the nth-degree, the XL2420G certainly keeps the XL family name in gamers' good books.

There's a lot to take in, with regards to the hardware and features of the XL2420G, and while all very good, the proof of this particular pudding is in how well it actually performs with all these features in the real world.

Thankfully, BenQ has managed to squeeze in a very good screen among that wonderful specification list. The G-Sync feature, to begin with, eliminates screen tearing and produces a much smoother image, particularly in gaming. The other elements, such as the low blue light and anti-blur technology, all combine to



▲ There's plenty of connectivity, but it is quite expensive



▲ The wired remote is handy, once you get to grips with it

make the XL2420G's screen output exceptionally clear, crisp and vibrant. Colour accuracy too is splendid, as well as greyscale reproduction.

The BenQ XL2420G comes in at around £350 at the moment, depending on where you shop. It may seem a little steep for a 24" monitor, but this is a high-end product and, we think, worth the expense.

mm David Hayward

An all-round stunning monitor, with tons of features



Netgear Powerline 1200

A wired rather than wireless network can be created without laying cables

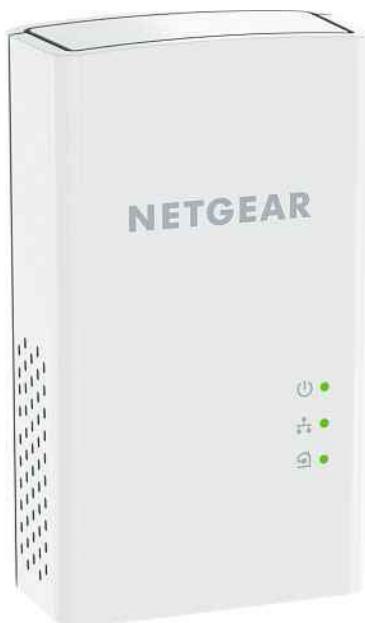
DETAILS

- Price: £69.99
- Manufacturer: Netgear
- Website: www.netgear.com
- Requirements: n.a.

Consisting of two Powerline PL1200 adapters, this Homeplug kit also comes with two Ethernet cables of approximately two metres each in length. As the product's title might suggest, these Powerline 1200 adapters claim a possible data transfer speed of up to 1200Mbps.

The PL1200 adapters have dimensions of 100 x 56 x 30mm (H x W x D), making them slightly bulky but not enough to cause problems when mounting them alongside other plugs. Located on the top half of each adapter is the three-pin plug element, while the base of the unit houses a gigabit Ethernet port and buttons for activating a security feature and a factory reset.

Obviously due to the design of the adapters, this is not a product that could easily be mounted on power sockets that are located on skirting boards – an arrangement found in many older buildings. Even if you could squeeze the adapter in the minimal amount of space between a skirting board power outlet and the floor, you would still have the problem of accessing the Ethernet port and security / reset buttons, due to the lack of space. Using an extension lead might help, but this type



of solution has been known to cause deterioration in data speeds.

Although both adapters are similar in appearance and could easily stand in for each other, they have different MAC addresses, serial numbers and passwords. This information is displayed on a white label located just below the plug element, where it becomes invisible when the adapter is inserted into a power socket.

Setting up the PL1200 kit could not be simpler. You only need to connect one adapter to your router via the supplied Ethernet cable and then plug it into an available power socket. A similar task then needs to be carried out with the second adapter, but this time linking it to whatever Ethernet aware device you're integrating into your local network. No actual software is required, although you could download

a Netgear Genie utility to monitor activity.

Arranged on the outside face of the adapters are clearly identifiable LEDs for power, Ethernet and a 'Pick A Plug' feature. The Power LED switches between green, amber and flickering green to indicate power on, power saving mode and security set up; the Ethernet LED will light up when a link is detected; and the 'Pick A Plug' feature can show how well individual electrical outlets perform as the LED glows red, amber or green, with green having the highest rating of over 80Mbps.

Using the 40-year-old electrical wiring system in my home, I was pleased to see that I received a green light, and the best rate I was able to achieve was a decent 101MB/s. The data, travelling from source to destination, passed through four rooms. This rate was fine for tasks such as streaming videos and music.

All in all, good speeds are achievable with these adapters, but as with any Powerline adapters, you're still going to be limited by the wiring in your home.

mm Michael Fereday

Not cheap, but you get what you pay for



WowWee MiPosaur

We bow down to our robot overlords

DETAILS

- Price: ~£99
- Manufacturer: WowWee
- Website: goo.gl/uvNvJG
- Requirements: Four AA batteries, four AAA batteries, Android, iOS devices for app

One of the biggest Christmas present items of the last couple of years was the rather impressive RoboSapien. The technology involved in this unique robot was exceptional, and both children and adults alike enjoyed programming and playing with it.

Now WowWee, the company behind RoboSapien, has returned with another great gift item for this year: the MiPosaur.

As you can no doubt tell from the title, this is a robot dinosaur, but there's nothing prehistoric about the technology it uses and how you can interact with it.

The MiPosaur measures roughly 400mm in length from the snout to the tip of the tail and is about 200mm from its wheeled feet to the top of its head. It's robustly constructed from a tough plastic throughout, and it feels pretty solid in the hand. It's obvious that this isn't a run-of-the-mill, cheaply produced product, but something that will last well beyond the festive period.

Once you've tackled with the extreme amount of packaging the MiPosaur comes in and inserted the four AA batteries into the compartment in the robot's belly, you can begin to interact with it and the numerous sensors it has.



▲ The MiPosaur and Trackball make for a great pair

In addition to the actual MiPosaur itself, the package also comes with a Trackball, which requires four AAA batteries. The Trackball works as a kind of 'toy' for the MiPosaur to play with, by allowing you to select a number of items from a selection wheel. For example, you can have the MiPosaur dance with the appropriate icon from the wheel selected. Or you can use the Trackball as a kind of lead to walk the MiPosaur around with, or even have it chase the ball, as you would throw a ball for a dog.

The interactions go further than simply using the Trackball, though. There's a collection of IR, sound, light and motion detection sensors throughout the MiPosaur, and with these sensors you can control it via a series of hand gestures above, in front or behind.

You can make the MiPosaur move forward, back, spin either direction and sit down. You can even make it purr, bark and pant. These actions are dependent on the current mood

of the MiPosaur; the default is Curious, which is indicated by a large blue LED on the neck of the MiPosaur. Other moods include Excited and Annoyed, and with each different mood, the MiPosaur can be interacted with and played with according to the gestures or with the Trackball. You can actually simulate stroking the MiPosaur to help calm it down from annoyed back to Curious.

There's a lot going on with the MiPosaur just with the Trackball and gesture interaction. However, to further increase its abilities, you can download a free app for both Android and iOS.

The app allows you use your device to control the MiPosaur, play a game with it, virtually feed it and fight with other MiPosaurs. There are also plans for more content such as a storybook mode and find and seek mode, with the probability of more as the development of the app improves.

To be honest, we had a lot of fun with the MiPosaur. It's a

very well designed product and we found the interaction to be extremely easy to use. There are times when the MiPosaur may miss a gesture, but slowing down slightly and repeating the move usually sorts any misread commands out.

All in all, it's a fun and unique gift for the curious and technologically minded young person or young at heart. For around £99, it's not too badly priced either.

mm David Hayward

A fun robot dinosaur, with plenty of interaction available



Ulefone uWear

Can a ultra cheap smartwatch really compete with the big boys?

DETAILS

- Price: \$19.26 with free shipping
- Manufacturer: Ulesoft
- Website: www.gearbest.com
- Requirements: Android or iOS phone

Before we get into the review of this watch, please bear with us for a moment as we provide a bit of background.

A couple of months ago, a press release dropped into our inbox, extolling the virtues of the Cube i10 tablet. In spite of costing just £82, it offered dual Windows and Android booting, as well as array of quite impressive features. This press release was written in broken English, and a visit to the retail site that issued it confirmed that the i10 was a cheap Far East product and would be sent from abroad.

We were intrigued, and we tried to get a review sample sent to us. Unfortunately, after a protracted and utterly confusing email exchange with the company's PR rep, in which we had explain that we didn't need payment for the review, we instead agreed to take a look at the Ulefone uWear instead (see, we got there eventually).

Just like the i10 that we're not looking at now, this is a device that promises a great deal, while costing next to nothing.

Physically, you get a small, square touchscreen, a micro-USB charging port on the side, a power/back button, and a soft rubber strap. Also, it has a dust and waterproof rating of IP65, so you don't have to worry about wearing it in the rain.

In terms of the software, you need to pair the uWear with an Android or iOS phone over

Bluetooth. This you can do via your phone's normal Bluetooth pairing procedure, but to really get the most from this watch, you also need to download and install the companion apps for your phone, which you can find by using a barcode scanning app to scan the QR code that's included in the uWear's main menu.

That's simple enough, but the problem is knowing which app to install, because there are two: BTNotification and Fundo Companion. The latter emphasises the health features of the uWear, such as the pedometer, sleep monitor and 'Sedentary', which is supposed to tell you if you've been sitting still too long. Oddly, though, all the notification features, which determine what you'll see on the watch, can be toggled by either app, making BTNotification a tad pointless.

Unfortunately, the instructions that came with uWear were written in something that only had passing resemblance to English, so we just installed both apps (from Android .apk files, rather than from the Play store), and did our best to work out how the phone and the watch are supposed to play together.

First off, after pairing the two, we tapped the 'Dialer' icon. This opened up a small number pad on the uWear, so we could type in a number and initiate a call. This worked well, and we were able not only to get the phone to connect, but we didn't have to take our phone out of our pocket, because the uWear itself has its own speaker and microphone. That means you get to talk into your watch like you're Dick Tracy. Whether or not you consider that a good thing is no doubt a personal preference, but we rather enjoyed it.

Next, we opened the contacts menu, and found, thanks to the

uWear syncing with our phone, all our contacts in alphabetical order. What we didn't find, though, was any way to quickly scroll through them, which meant having to use the tiny touchscreen to go down the list, a few names at a time, until we eventually came to the one we wanted. That was bad enough, but what made it even worse was the fact that the screen sometimes didn't register our touches.

On the plus side, the touchscreen is responsive enough in the main menu, and the notification system works well. You can choose, via the app, which phone notifications will appear on the watch, so when you get a message or something, it will pop up on the uWear's screen. Tap on a message, and you can read it. If it's a long message, you'll once again be thwarted by the screen as you try to scroll down, but just as a way of getting your attention, it works well enough.

Indeed, many devices that simply vibrate when you have a message or call cost more than the uWear, but this watch has a surprising amount of features. In addition to what we've mentioned already, you also get a calculator; a small, month-view calendar; an altimeter (which we couldn't get to work); an alarm function; a barometer (which also didn't appear to work); the ability to control your phone's camera remotely; an 'Anti lost' feature to help you locate your mobile or the watch if one of them is missing; and an audio player, which is designed to let you skip tracks on your phone, as well as pause, play and alter the volume. This last feature, though, didn't actually work as expected when we tried it. When we paired the uWear with our Android phone, it



simply designated the watch as an audio output. Yes, we could skip tracks and so on, but the music played not from the phone, as we'd have liked, but from the watch itself. We're don't want to seem fussy, but listening to music via a small, tinny speaker on our wrist doesn't seem all that practical or enjoyable.

Clearly, then, the Ulefone uWear is not without its problems. Most of them are software related and could probably be fixed easily enough. Perhaps that's encouraging, but we're not optimistic the manufacturer will bother to remedy these problems, so in the end we just feel disappointed.

Of course, any such feelings are tempered by the fact the uWear costs so little. The parts of it that work are certainly worth more than the price and, if anything, it's Ulefone's own ambition that is its downfall. Had it not tried to shove so many functions in here, it would have perhaps been more successful.

mm Anthony Enticknap

Cheap and, at least sometimes, cheerful



GROUP TEST

Dual-band Wireless Routers

The router has come a long way in such a short space of time. Where it was once an expensive addition to a network, external to the modem and offering very little to the home user, it's now the most used item of technology we own.

David Hayward tests six dual-band wireless routers this week and tries to see which are worth your cash.

Dual-band Wireless Routers

Asus RT-AC68U

DETAILS

- Price: £110
- Manufacturer: Asus
- Website: goo.gl/Rbjp6B
- Requirements: Separate ADSL modem, any modern web browser for administration

This Asus router was released late in 2013, but despite its age, in technological terms, it's still quite a strong contender in the wireless router market.

The Asus RT-AC68U measures 310 x 160 x 83mm and is a vertically positioned dual-band router, with three large antennas jutting out from the top. Around the back of the unit there are four gigabit Ethernet LAN ports, a single gigabit Ethernet WAN port, front power LED, a single USB 3.0 port and, next to it, a more traditional USB 2.0 port. You'll also find the power socket and power button in the bottom corner, and around the sides are WPS and wireless on/off buttons.

The front of the router features a series of blue LEDs indicating the status of the various connections and data activity across the LAN and

WAN ports, as well as the wireless status.

As for design, the RT-AC68U has been described by some pundits as an aggressive-looking unit, and it's not too surprising to see why. With the antenna spread out above and the sheer size of the router bearing down, you can be forgiven for thinking it's quite an ominous addition to the otherwise more friendly looking technology in the living room.

However, the RT-AC68U is an impressive performer. With a theoretical bandwidth speed of 600Mbps + 1300Mbps, it has an impressive 1900Mbps data rate. These numbers are all thanks to the Broadcom BCM4709 processor inside the router, along with its TurboQAM technology, which greatly improves the speeds and throughput of the older 2.4GHz band. In addition to this, the RT-AC68U's dual-core ARM-based Cortex A9 processor and 256MB of memory certainly go a long way toward providing a more impressive network traffic management computer compared to more traditional routers.

Unfortunately, to enjoy these speeds to their full potential, you'll need to connect a compatible TurboQAM device



otherwise, like the rest of us, you're left with pretty much the same throughput speeds as you'd normally see with any other router. That said, we experienced a far better range of wireless connection, and the media viewing we tried, via DLNA, was superb and without fault, even when we had several devices all watching the same content.

In terms of the administration software, it's clear and good enough for most users to get to grips with. There are some sections that would require a little more knowledge about networking in general, but the built-in help function is good enough to talk you through the basics. And there are some excellent extras in the form of a network map and clear icons to help set up a hard drive to one of the USB ports.

The Asus RT-AC68U is an excellent performing router. The addition of USB 3.0 speeds things up for local connectivity, as do the impressive internals and processing power. True, it's not the best looking or most discrete router on test, but it is the fastest.



▲ The Asus RT-AC68U is a very capable router



▲ To get the best performance, you'll need a TurboQAM device

Netgear DGND3700 N600

DETAILS

- Price: £105
- Manufacturer: Netgear
- Website: goo.gl/yCcjZ
- Requirements: Any modern browser to connect and administration

Netgear's networking products range from the cheap and cheerful, through to the more expansive and quite technically brilliant. It's not a bad position for the company to be in, because even various ISPs use a 'fixed' Netgear router.

The Netgear DGND3700 N600 is a complete package of a DSL modem and router. It's a more traditional-looking upright device, measuring 223 x 153 x 31mm and featuring dual-band 5GHz and 2.4GHz technology with N600 and a theoretical combined bandwidth of 600Mbps (300Mbps + 300Mbps).

Around the back of the unit there are four gigabit Ethernet ports, a single gigabit Ethernet WAN port, a single USB 2.0 port, power socket and power button, and the integrated ADSL2+ modem. The front of the router is slightly less packed, with a WPS button, another USB 2.0 port and a row of LEDs indicating the various connections, ports and so on.

Within the router are the antenna for the dual-band wi-fi, 128MB flash memory and a further 128MB of memory for processing the data packets and streamlining the router operations.

In terms of design, the DGND3700 is fairly nondescript, but overall it's a decently constructed unit. However, the stand doesn't feel particularly



▲ The Netgear DGND3700 N600 is a pretty good router

sturdy, and we're not sure how much it could take if the router was moved around frequently or knocked daily.

The included software is very commercial in its appearance, wording and available features. There's certainly a lot here to suggest it's aimed at the business market, with items such as multiple SSIDs across each band and an incorporated traffic meter function that will issue warnings if a pre-configured connected device goes beyond a set number of megabytes.

Generally, these are options that most home users will never even look at, let alone actually use. Being able to limit the bandwidth on certain devices sounds like a great idea, and it is for the business user, but for the home user it's a little unnecessary.

Also, the administration page and menus are significantly confusing, as are the explanations and documentation. To more knowledgeable users, every aspect of the admin page probably makes perfect sense, but to regular people it's not

particularly fluid or easy to understand.

Naturally, the addition of the built-in ADSL modem is a pretty good selling point. Even if you don't want to use that function, the WAN port will connect to your ISP's fibre kit easily enough. Moreover, the dual-band gigabit ports and two USB ports (although only USB 2.0) add more tantalising features and, in a way, so do the more commercial options and features. The only problem we have is the level of expertise this router requires. It's fine taking business software and using it in home hardware, but you have to make sure it's aimed at home user enough to warrant the use of the extra features.

In spite of that, it's an impressive router, which has just about everything you could possibly think of.



Dual-band Wireless Routers

Trendnet AC750 Wireless VDSL2/ADSL2+ Modem Router

DETAILS

- Price: £50
- Manufacturer: Trendnet
- Website: goo.gl/p1PWwO
- Requirements: Any modern browser for administration, may need a separate gigabit switch for faster speeds between wired devices



▲ The Trendnet AC750 is a good all-round router



▲ But it lacks the faster gigabit Ethernet speeds

In terms of the software side of things, this Trendnet router is packed with remote management support, port mapping, 3G WAN backup, IPv6, Samba, Dyn DNS support and DCSP quality of service, among other features.

The initial management page is reasonably well organised, easy to understand and laid out in a way that won't necessarily confuse newcomers but still capable of giving more advanced users access to the right features.

The wireless speeds of the router were certainly good enough for the limited test equipment we were using, as were the wired speeds. Of course, it would be significantly better to have had four gigabit Ethernet ports along the back and a pair of USB 3.0 ports, but for the sake of home streaming of media, 100Mbps will suffice.

We were actually fairly surprised as to how far the wireless signal stretched with this model. Some of the other routers we tested barely made it past the end of our house and into the garden, but the Trendnet AC750 managed to get a good ten metres further. In fact, only one router in this test did better.

We're not sure why it has more transmitting power than the other models so far, but we're guessing that the internal antenna are of a better quality – or we were just lucky in this particular instance.

Whatever the case, the Trendnet AC750 VDSL2/ADSL2+ modem router is a pretty good buy for most home users, especially since you can pick one up for as little as £50. You'll be missing out on wired gigabit speeds and you don't get USB 3.0 either, but you'll have an effective wireless solution for all your connected devices, without too much hassle from technical jargon and excessive acronyms.



BT Home Hub 5

DETAILS

- Price: £129
- Manufacturer: BT
- Website: goo.gl/J4whXc
- Requirements: Any modern browser for administration, works best with a BT Infinity package



▲ It lacks the freedom and features of other non-ISP supplied routers

Most of the time, ISP-provided routers leaves a lot to be desired, but BT has managed buck that trend with the release of its Home Hub 5. It's a few months old now, but for those who are on BT's Infinity package, it's certainly one to opt for or upgrade to.

Among its list of features you'll find dual-band wireless, 2.4GHz 802.11n dual-stream 2x2 MIMO and 5GHz 802.11ac dual-stream 3x3 MIMO, as well as backward compatibility with 802.11b/g and so on.

It measures 116 x 236 x 31mm and is quite a slick-looking, well-constructed unit. Around the back you'll find four gigabit Ethernet ports, an ADSL port, a gigabit WAN port, pin-hole reset, a power button and a single USB 2.0 port. At the top of the Home Hub 5 you'll find two large buttons for reset and WPS,

with the front clear of anything other than a single large LED that emits a range of colours depending on the state of the router and connection.

Not surprisingly, the software side of the Home Hub is fairly basic and locked down to some degree. You can enter an advanced setup and access port forwarding, dynamic DNS and so on, and you can configure the device that's attached to the USB port. But essentially, it lacks the more powerful features and unlocked aspects

of the other, non-ISP supplied routers in this group.

Having said that, we did find that the Home Hub 5 was one of the fastest routers we had on test. The gigabit Ethernet ports all operate to the maximum, and both wireless bands offer fantastic range and speeds with the connected devices. In fact, in terms of range, the Home Hub 5 was only a metre short of the Trendnet AC750, reaching through two rooms and well into the back garden before the signal was eventually lost.

One problem we did have was the occasional loss of the attached USB storage device we tested the Home Hub with. One minute it was working fine, streaming content, but after pausing the media for about 20 seconds, we found that the device was no longer identified, even when we unplugged it and plugged it back in. In the end, we had to power cycle the Home Hub and re-attach the USB stick.



▲ The BT Home Hub 5 has plenty of connectivity



The higher speeds at 5GHz were certainly impressive, considering this is an ISP-provided router, topping 250Mbps at around 20 metres from the Home Hub itself. However you may feel about BT and its operations, you can't fault the raw speeds that the Home Hub 5 can achieve when used with the right devices.

Overall, we found the BT Home Hub 5 to be a pretty good wireless router. Since our tests were conducted on an Infinity line, you could say the Home Hub had a natural advantage, but the proof of the pudding was with the connected devices, and in this it shone particularly well.

It's quite expensive to buy outright, though, at around £129 from the BT shop, but if you have a BT contract in place you can probably upgrade for considerably less. And if you already haven't, then we recommend you do so.

Dual-band Wireless Routers

Trendnet AC1750 Dual-band Wireless Router

DETAILS

- Price: £90
- Manufacturer: Trendnet
- Website: goo.gl/m8smQ4
- Requirements: Separate ADSL modem, any modern browser for administration

This is the second Trendnet product to feature in this group test, and it would seem that Trendnet has tried to raise the bar somewhat with this example.

The AC1750 dual-band wireless router is a pretty impressive looking box that measures 72 x 151 x 191mm and comes with a vast range features. First off, there's the dual-band technology, with 2.4GHz and 5GHz support for 802.11a/b/g/n/ac through a pair of powerful internal antennas.

The rear of the router has four gigabit Ethernet ports and a single gigabit WAN port, along with a USB 2.0 port, power and power button and a WPS button. The front of the router has a simplified two LED arrangement, indicating power and internet connectivity; there's also a pin-hole reset located at the base of the device.

The design is quite impressive, with it being finished in a matte black and constructed from a lightweight plastic. The sides boast the Trendnet logo on top of a brushed aluminium effect panel, and there's a glossy black base to finish things off nicely.

There are plenty of features available with the Trendnet AC1750, such as advanced traffic shaping, traffic mapping, an isolated guest network, parental controls

▲ The Trendnet AC1750 looks and performs exceedingly well



▲ However, the web-based portion did feel a little clunky at times



and targeted beam forming for directing stronger wireless signals to a specific location. However, chief among the features is the Qualcomm StreamBoost technology.

The Qualcomm StreamBoost technology essentially prioritises traffic flow for gaming, media and voice data in a more aggressive quality of service fashion. Although we didn't specifically measure the throughput of the router, we did find that our attached devices seemed to behave and navigate better through gaming and media content than with the other routers on test. And to add to that, the Skype call we conducted on the wired network didn't have quite as many jumps in video or momentary losses in voice as with the other routers.

You'll also find IPv6 support, two additional SSIDs per band, a Samba and FTP server and port forwarding for special applications and games. Needless to say, there's everything you could possibly ask for from a modern router within this single unit.

There was one problem we had with the software side of things, however. While easy to use, we did find the navigation of the web administration a little clunky and prone to not loading menu and image holders at times. A quick page refresh usually cured this, but navigating through the menus did seem very slow in comparison to the other Trendnet router we tested for this group.

Overall, we found the Trendnet AC1750 dual-band

wireless router a pretty solid and speedy network device. It may lack USB 3.0 and an ADSL port, but if your ISP is set up to take it and you want a router with gaming, media and voice/video prioritised traffic, then this is certainly one you should be looking into. And for around £90, it's priced reasonably well too.



Netgear Nighthawk R7000

DETAILS

- Price: £150
- Manufacturer: Netgear
- Website: goo.gl/4UgrU4
- Requirements: Separate ADSL modem, any modern browser for administration

This is the second Netgear review in the group, and with a name like Nighthawk, you would expect something pretty dramatic from this impressive-looking router.

The Netgear Nighthawk is, apparently, fashioned after the Nighthawk stealth fighter, obviously representing speed and an array of abilities – and in many ways, it doesn't disappoint in this respect.

The router's dimensions are 285 x 184 x 50mm, and it comes with simultaneous dual-band 2.4GHz and 5GHz wi-fi supporting 802.11a/b/g/n/ac through three large, powerful antennas protruding from the back of the unit.

As you'd expect from something that's modelled like a modern flying weapon, this is quite a dominating thing to have on show in your living room. The wedge-shaped, matte-black front, with sloped mesh sides, shows a row of LEDs indicating the states of the rear four gigabit Ethernet ports, gigabit WAN port, USB 2.0 port, internet and power. The front also hides a USB 3.0 port just below the row of LEDs, discreetly tucked away so as not to lessen the overall design but still keeping it functional.

Inside you'll find a Broadcom BCM4709 SoC



▲ The Netgear Nighthawk is an imposing looking router



▲ It's also fast and has a fantastic range too

with a 1GHz ARM Cortex-A9 dual-core processor and 256MB of memory. This processing power fires the Nighthawk along at a rate of knots and when combined with such features as prioritised traffic for gaming, video and media streaming, you can be certain that whatever you plug into it will function at its maximum potential.

Other features include implicit and explicit beam forming, reduced lag from slower wi-fi attached devices, secure cloud access setup for

any USB storage devices you plug in to it and the usual Samba, FTP and VPN support.

The Nighthawk uses the upgraded Netgear Genie web administration software, which is, for the most part, easy to use and understand for beginners, while still being accessible for those who want to enter the advanced side of the setup. Although good, we did find it often took a good minute or so to activate a certain feature, such as the parental controls. However, it was nothing to get too distressed about.

What really matters is that the Nighthawk is the fastest router we have in the group, and also the best in terms of the distance of the signal. Not only did it penetrate the walls of every room in the house it was tested in, but we also picked up the signal right at the back of the garden some 30-odd metres away, which is pretty impressive.

One element we did find a little odd was the location of the USB 3.0 port. While the design is spectacular looking, it's somewhat ruined by having a big ugly cable permanently dangling from the front of the unit to a USB drive. It's not totally terrible but an odd decision from Netgear.

The Netgear Nighthawk R7000 is an exceptionally powerful router, with plenty of features and more than enough technology for the next generation of connected devices. It does cost in the region of £150, but if you demand the best networking from your router, then this is the product for you.





Netgear DGND3700 N600

In the end, that Netgear DGND3700 N600 comes out on top. It has everything you could ask for from a single box, including a built-in ADSL modem and other networking features.



Netgear Nighthawk R7000

Although it's the most expensive router on test, the Netgear Nighthawk is by far one of the most impressive routers we've tested in quite a while.

The only downsides are the price and the front USB 3.0 port. Perhaps the next version will keep everything around the back of the unit?

How We Tested

Each router was tested by connecting a collection of wired and wireless devices: three desktop PCs, two laptops, four Android tablet, two Android phones, a PS3 and LG Smart TV. To test media capabilities, we connected a USB hard drive with several HD films to stream across the network, as well as a NAS drive.

Each wireless device was tested to limits within a house, where the router was located in the living room at the front of the house, to a maximum of 40 metres.

	Asus RT-AC68U	Netgear DGND3700	Trendnet AC750	BT Home Hub 5	Trendnet AC1750	Netgear Nighthawk
Price	£110	£105	£50	£129	£90	£150
Size	220 x 83.3 x 160mm	223 x 153 x 31mm	190 x 146 x 55mm	116 x 236 x 31mm	72 x 151 x 191mm	285 x 184 x 50mm
Weight	640g	500g	323g	290g	408g	750g
Ports	4x gigabit LAN, 1x gigabit WAN, 1xUSB 2.0, 1x USB 3.0	4x gigabit LAN, 1x gigabit WAN, 2xUSB 2.0, 1xADSL	4x 10/100 LAN, 1x gigabit WAN, 2x USB 2.0, 1x ADSL	4x gigabit LAN, 1x gigabit WAN, 1x USB 2.0, 1x ADSL	4x gigabit LAN, 1x gigabit WAN, 1x USB 2.0	4x gigabit LAN, 1x gigabit WAN, 1x USB 2.0, 1x USB 3.0
External Antennas	3	0 – internal	0 – internal	0 – internal	0 – internal	3
DLNA	Yes	Yes	Yes	Basic USB sharing	Yes	Yes
Remote Access	Yes	Yes	Yes	Yes	Yes	Yes
FTP Server	Yes	Yes	Yes	No	Yes	Yes
Print Server	Yes	Yes	Yes	Yes	Yes	Yes
Measured Wi-fi Range, Out 40m	~18m	~15m	~25m	~24m	~20m	~30m

Your Letters

Updategate Article (Great)

Can you pass on my thanks and notes to Mark Pickavance. Might be nice to do a follow-up?

I have a couple of Win 7 laptops. I decided I don't want/need the win 10 upgrade (for now)

By sheer luck I have avoided the infestation by update KB3035583 mentioned in the article. I long ago selected the option to notify updates but do not install automatically. I normally have a quick look at the end of the month just before doing a Windows backup with drive image, removing any updates that look iffy or unnecessary.

Today (1st October), I did the backups but had forgotten

to install the latest updates at the end of September. Phew!

Sure enough, KB3035583 is there waiting. I probably would not have suspected anything. If you click for more info, it looks like it installs a small app, to offer to install Win 7.

Mark could not suggest any advice for affected Win 7 machines. Maybe we could ask Microsoft to comment? Can we raise the profile of this? TV? Twitter or whatever.

Anyway, if affected, I would have tried a restore point to uninstall recent updates. Windows backup makes a restore point before installing updates.

So anyone using tools like Windows backup might be able to revert to an earlier

configuration, and turn off automatic backups too, until said unwanted update is removed.

I could have tried a Backup Image restore as a last resort.

If drive space is problematic, can the hidden folders that Mark mentioned be deleted (if you know how to see them)? Uninstall the update, etc?

Hope this is constructive.

Personally, I am outraged and am now thinking of trying a Chromebook or something, as I don't do much else other than write documents and surf websites. Now I have cloud ready e-printer, I am in good shape for this.

Microsoft have almost certainly lost another customer.

George Fleming

Why I (Don't) Love BT

I sympathise with Dave Shaw's frustration with BT (MM1383). I had similar experience when, after a few years of stable operation, my 3Mb broadband connection (I'm over 6km from my local exchange) started misbehaving. Speeds often fell to around 1Mb, with the connection frequently dropping out completely.

On contacting BT customer service (located in India!), I explained that the diagnostic information I had suggested the problem lay somewhere between the local exchange and the end of the line entering my property. I was told in very poor non-technical English that there was a software problem and that it would be fixed within 24 hours. Of course, it wasn't fixed!

I went through this tedious procedure FOUR times! Only on the fourth occasion was I able to extract an assurance that the matter would be passed on to a local technical service operative, and that I would be contacted the next morning to progress it. Early that morning, I received a recorded message to tell me to expect the contact before noon. By 3am that afternoon,

I had not had any contact, so I phoned a local company (kencomp.net) to arrange for a new broadband connection via a micro wave radio link. This new connection was set up within a couple of days. I now have a not too expensive and very reliable connection at 10Mb (i.e. over three times the speed of the BT/copper wire link). I could have opted for a 50Mb connection. I also have easy access to very helpful customer advice and support from technically competent people who speak in clear English and who are situated in an office only a few miles away from my location. Yippee!

BT did eventually contact me a couple of hours after I had arranged for the new connection. No apology or explanation was offered for the lateness of this contact. I leave readers to imagine my response. To add insult to my extreme frustration, BT insisted on charging me £30 to disconnect their malfunctioning link.

As an exercise in how to alienate willing customers, this is top class. Well done, BT!

Ken Hough

A Groveling Apology To BT

Dear Lovely Cuddly BT,

- I am so very very sorry I wrote those complaining e-mails
- to that evil publication Micro Mart. You are the best company in the world. Your technical support team are superb, with the knowledge of the ancients at their fingertips. Your service is second to none. I am about to set off to your headquarters on my knees
- as a penance for my misdeeds. I will be whipping myself every yard and chanting long live BT and Openreach.

- In the meantime, could you in your infinite wisdom improve my pathetic broadband. When I get back and my knees heal, I will sing your praises from the rooftops.
- If this is not sufficient for you, I will sacrifice a hundred goats outside your headquarters for your pleasure and delight. My family have agreed that if these penances are insufficient, I may sacrifice one of them every day until either you improve my broadband or I run out of family members. Just what more do you want?w

Dave Shaw

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Green Apple?

**David Briddock investigates
Apple's environmental credentials**

If you take the time to read Apple's Facilities Report on Renewable Energy and you'll see the quote, "Our goal is to power every facility at Apple entirely with energy from renewable sources – solar, wind, hydro and geothermal." This raises many questions. Is this actually possible? How will it be done? How much has already been achieved?

Big Challenge

There's no doubt it's an enormous challenge for the firm. Take those huge data centres that power the web and our everyday cloud-based services. The current crop already consume a significant percentage of the planet's global power production, and they're only getting bigger and more numerous. In fact a Greenpeace report estimated that the aggregate electricity demand of the cloud's data centres and networks was 684 billion kilowatt-hours in 2011.

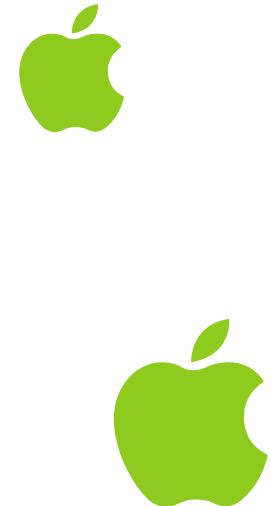
To put this in context, if the cloud was a country its energy consumption would be around twice that of the UK and rank sixth in the world, behind China, US, Japan, India and Russia but above Germany or France. Concern over energy consumption figures led to the European Commission's Institute for Energy defining a code of conduct on data centre energy efficiency (goo.gl/mzFg2r), which outlines 155 recommendations for

making data centres more efficient. Unfortunately, participant take-up has been small so far.

As for Apple, let's take its Maiden Carolina data centre as an example. It's one of the largest in the world. Dubbed the 'iDataCentre' by the media, it exceeds 500,000ft², cost \$1bn and it's estimated to require something in the range of 100 megawatts of power. The cooling systems alone consume around 40% that total energy requirement. That's a lot of power for a company that has now publicly committed itself to becoming a carbon-neutral company by using renewable energy sources. With this in mind, it's not surprising that only a few years ago it was far from the leader in this endeavour.

Bad Report Card

In the past Apple has come under attack from green organisations and environmental pressure groups like Greenpeace, which accuse it of putting profits before the planet. Of course, it's not just Apple; just about every other large technology company falls short in some aspect of its green credentials. However, with its enormous profit margins, Apple has been singled out as the one that could do most about cleaning up its act in terms of renewable energy, recyclable components and the substitution of rare and toxic materials.





▲ Solar Array at Maiden, North Carolina

Back in 2011 Greenpeace released a report called *How Dirty Is Your Data?*, which graded each Internet firm on the filthiness of its cloud operations. Apple earned the dubious distinction of being among the worst climate offenders, with a high reliance on coal and a low score for clean energy sources. The report appears to have been a wakeup call for the company, and it fairly swiftly initiated a programme to begin putting things right. It couldn't be addressed overnight, but would take years to fix, but there has been a distinct sense of urgency to its work.

Rapid Change

Move the clock forward around three years, to April 2014, and anyone reading Greenpeace's latest comprehensive 84-page *Clicking Clean* report (goo.gl/SXqYmi) couldn't fail to notice how things have changed. This time around, Apple was at the head of the class, with an unbeatable 100% of its total data centre power consumption coming from renewables (see the 'Clean Energy Offenders' image below).

In case you're wondering, those aren't just US-based data centres. It's recently announced European sites will also be driven by 100% renewable energy; in fact, Apple is spending an additional \$2 billion on renewable energy projects for data centres in Ireland and Denmark, and the focus on improving its environmental footprint goes much further than data centres.

Apple's HQ building – in Cupertino, California – is also supplied from 100% renewable sources, as are all of its US Apple Experience stores and the vast majority of its non-US stores, including ones in the UK, Germany, Spain, Italy and Australia.

All this costs plenty of money. Yet, a greener Apple will in turn rewards its shareholders who'll benefit from the good-news stories and its industry-leading initiatives. So, let's look at how Apple managed to turn things around over the last few years.

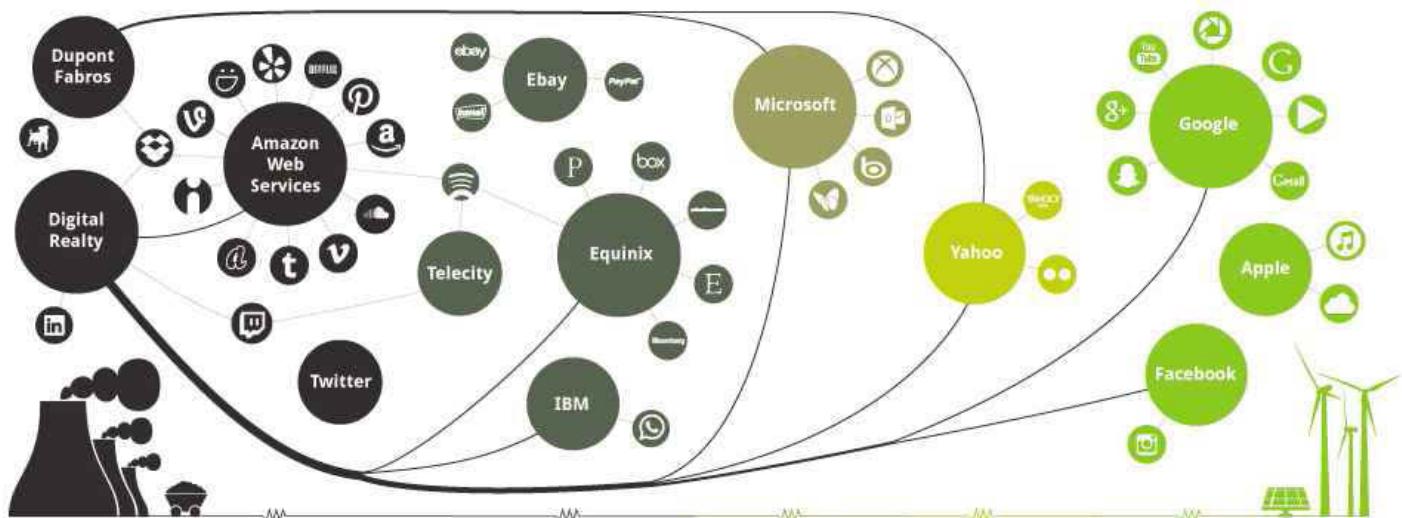
Solar

With many US data centres located in sunny climes converting sunshine into power is an attractive proposition. The plan is to generate energy when the sun is shining at its brightest and only use other energy when costs are at their lowest. A prime example of this thinking is the deal Apple made with First Solar. Over a 25-year period Apple will commit \$848 million for the power, while First Solar will construct the solar farm. The energy output is used for Apple's offices, including the huge circular Campus 2 site, a number of data centres, and around 50 Apple Experience Stores.

“The solar farm is vast in scale, covering 2,900 acres of land, 1,300 acres of which is specifically for Apple”

The solar farm is vast in scale, covering 2,900 acres of land, 1,300 acres of which is dedicated to the production of 130 megawatts specifically for Apple. The rest is used for other customers. Lisa Jackson, Apple's vice president of environmental initiatives said, "There's a huge economic benefit because we're going to potentially save hundreds of millions of dollars over the life of the deal."

Meanwhile, in North Carolina, Apple already has two 20 megawatt solar farms, with a third one on the way (which also includes a 10 megawatt bio-gas facility). This green energy is then added to the grid, and the local Duke Energy company pays Apple for the electricity it produces.



▲ Clean Energy Offenders



► Lisa Jackson

Importantly, Apple also receives a tax-credit for the solar farms through government incentives, which undoubtably helps when talking to shareholders. It's work has also helped North Carolina become the leading source of solar in the South, and the fourth in all of the US.

Solar is an ongoing commitment, we're told. Apple recently announced plans to convert a former sapphire factory in Arizona into a \$2 billion data centre powered almost entirely by solar power. While in China the enormous Hongyuan solar farm can generate more renewable energy than required by all its corporate facilities and retail stores in the country.

Hydro

Hydro power is also on the agenda. Hydroelectric power plants produce electricity by capturing the energy from falling or flowing water. And hydro is the world's most widely used form of renewable energy, currently accounting for over 16% of total global electricity generation.

Apple has already acquired a small hydroelectric plant close to two 338,000ft² data centres it has located in the city of Prineville, central Oregon. This facility can only help provide the power they need, though, as it is said to only generate three-to-five megawatts; that's a relatively small figure, as large data centres of this kind typically require at least 30 megawatts. The bigger picture was clarified by an Apple statement that said: "Our data centre in Prineville, Oregon, is every bit as environmentally responsible as the one in Maiden, North Carolina. Oregon allows the direct wholesale purchase of renewable energy through a Direct Access program."

This means that Apple is using the program to opt out of the default power-grid-mix and directly access local renewable wind energy to help power the facility.

Switching Materials

Mining materials like aluminium, iron, copper, gold, silver and palladium requires extensive land allocation. It also generates greenhouse gases and other emissions. Recycling these materials reduces some of the mining impact, however. For example, Apple states in 2014 it recovered enough steel to build over 161 kilometres of railway track.

Rare materials are another problem. They're often found in troubled places, such as economically impoverished areas or war-torn African countries. Extraction of these materials can involve child labour, below subsistence wages, dangerous working conditions and environmentally destructive techniques.

Then there's toxic materials. These include mercury, lead, arsenic, polyvinyl chloride, brominated flame retardants,

phthalates and beryllium. The last of that list is cited as being one of the most toxic elements on the planet. It's no shock, then, that Apple is keen to remove the need for rare and toxic materials from its product line.

Take the latest iPhone 6, 6 Plus, 6S and 6S Plus models for example. They have a mercury-free LED-backlit display and use arsenic-free display glass. They are also brominated flame retardant-free, PVC-free and Beryllium-free. The aluminium frame is fully recyclable and even the speaker enclosure uses 30% recycled plastic.

To ensure consumers can evaluate a specific product's green credentials there's the Electronic Product Environmental Assessment Tool (EPEAT). Each product receives a Gold, Silver or Bronze rank depending on its efficiency and sustainability. Every EPEAT-ranked Apple tablet, notebook, desktop computer and display has a Gold rating.

“ Our goal is to power every facility at Apple entirely with energy from renewable sources – solar, wind, hydro and geothermal ”

This kind of approach has attracted top people in the environmental field. For example Lisa Jackson (goo.gl/JWxTUH), who was formally Administrator of the US Environmental Protection Agency, an appointment made by President Barack Obama. Jackson's task is to ensure Apple's product focus doesn't come at the cost of taking care of the planet.

As Jackson says, "We ask ourselves all the time how to make things better and you can see it in not only our products, but in the environment as well." While Jackson is adamant that Apple wants to achieve that elusive 100% green status, she herself notes that Apple has only just scratched the surface of innovation on this front.

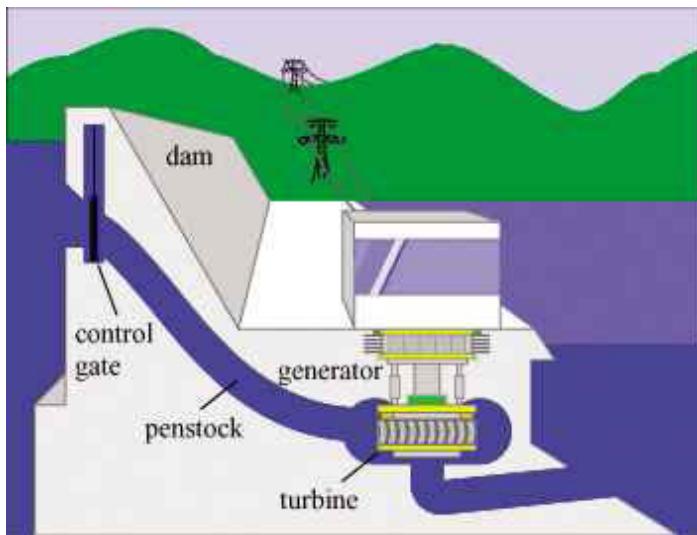
Product Recycling

In 2010 Apple set itself the challenge of achieving an ambitious worldwide recycling target, namely 70% of weight across its product line. Since then it has consistently reached an impressive 85%, with 40,396 metric tons of e-waste collected through its take-back programmes in 2014 alone.

Today every one of the 450+ Apple Retail Stores offers responsible recycling through the Reuse and Recycling Programme. Customers bring in old iPhones, iPads, Macs or PCs into local Apple stores, where the company recycles them free of charge. In some cases they'll receive credit towards a new model and, if the old electronics can be reused, the consumer gets an Apple Gift Card.

The recycling programme reaches 99% of the countries where





▲ Hydro Plant

Apple products are sold. It includes free shipping on e-waste returns, organised collection events and ongoing take-back initiatives with governments and universities.

Handling Waste

Apple is aware manufacturing plants can generate large amounts of environmentally damaging waste. However, its multi-use facility in Cork, deep in the south of Ireland, has set a new standard by receiving the first UL Zero Waste to Landfill validation outside North America. Despite handling both corporate and manufacturing operations none of its 13,400 metric tons of annual waste is sent to landfill.

So how did the Cork facility achieve this Zero Waste to Landfill validation? Well, the iMac component packaging is reused to ship iMacs to customers. All cardboard, foam packaging, plastic trays, electrical cables and pallets are recycled. Even the campus cafeteria's cooking oil is recovered to produce biodiesel fuel.

Less is more in recycling terms. And Apple's drive to make each new iteration of a product smaller and lighter means there's less material to recycle.

For instance, the current Mac Pro uses 74% less aluminium and steel than the previous design. A 21.5" iMac is made with 68% less material than the first iMac. And the new MacBook uses 32% less aluminium than the first-generation MacBook Air.

Local Environment Care

But a full green recycling programme goes much further than metals, glass, plastics and the like. Water is one of the world's most precious resources too. So it's important to find ways to reduce water consumption during manufacturing, cooling, landscaping and sanitation.

For example, Apple's Maiden data centre in North Carolina uses an innovative cooling system that can reuse water 35 times. The result is a 20% reduction in overall water consumption.

When facilities are located in dry climates Apple uses drought-tolerant landscaping and drip irrigation, plus sophisticated sensor systems that monitor local weather conditions and soil moisture. This can lead to a 40% reduction in landscape watering. These tactics are already in place at Apple's Infinite Loop campus, which is surrounded by over 700 drought-tolerant trees. In addition Apple's Conservation Fund is used to create and protect sustainably managed forests, which are then used for paper and packaging.

More To Do

Apple has publicly stated it's working toward getting the company's global operations to run entirely on renewable energy. Yet there's still some way to go before it can claim to have achieved that lofty goal. For example, its data centre backup power facilities aren't included in the reports we've mentioned so far. What's more, as yet, the bigger green picture doesn't include things like manufacturing and transportation – which, in reality, accounts for 98% of Apple's total carbon footprint upon the world.

“ Every Apple Retail Store offers responsible recycling through the Reuse and Recycling Programme ”

Of course, Apple can well afford to do more – it's profits certainly haven't diminished because of the steps it's taken so far, that much is for sure. Having publicly communicated its environmental goals means the media (and Greenpeace) will expect more too, and the spotlight will be well and truly on the steps it is taking. Apple's ever-growing customer base will expect it to live up to its ideals, too, including the 800 million credit-card registered iTunes users (in contrast Amazon.com only has around 237 million active customers).

There's no doubt, though, that Apple has upped its game. Now the onus is on others to improve their own green credentials. Google, for instance, is turning to wind power and has signed three power purchase agreements over the last few years. One 10-year agreement is with Dutch power company Eneco in November 2013 to buy a new wind farm's entire output for its £400m+ data centre at Eemshaven in the Netherlands. The other two agreements are with wind farm developers in Sweden to power its Finland-based Hamina data centre with renewable energy.

Locating data centres in colder northern climates makes the job of cooling racks of hot processors a little easier, something Facebook plan to capitalise on with its 30,000m² building in Lulea, northern Sweden. That's a location also well renowned for creating a significant amount of hydro energy, while places like the similarly chilly Iceland can offer the opportunity to tap into local, freely-available geothermal energy resources.

Greener Future

Apple understands that in this day and age, with environmentally savvy consumers, industry leading green credentials are important for continued customer support. Environmental care is also important for Apple's future expansion plans. For instance the heavily rumoured electric car or home-based power-generating technologies like fuel cells.

While Apple is currently leading the green charge, Google and Facebook have made good progress over the last few years too. This means that poor green performers like IBM, Ebay, Twitter and especially Amazon are now under increasing pressure to speed up their own environmental efforts. That can only be a good thing for the planet. **mm**

Remembering... MMX Processors

David Hayward tries to understand Intel's abbreviations

Just as the computing world was getting used to the high clock speeds of the DX range of Intel processors, there came a point early in 1997, when adverts in magazines and on the TV announced the next generation of CPU: the MMX.

No doubt you recall the dancing Intel engineers in their hazmat (Bunny People) suits, grooving along to the Bee-Gees, with narration from the legendary Casey Kasem? Well, if you do, then you'll probably also remember that the MMX processor was hailed as the greatest advance in home computing ever, with support for better video, improved gaming, faster processing and a better cache to handle all these ultra-new instructions.

Ranging in speeds from 133MHz through to a massive (for the time) 233MHz, the Pentium MMX was the bee's knees. Indeed, Intel's fifth-generation processor certainly had everyone in a fever over the amount of transistors it had compared to the previous generation of processors, and the enhancements we were led to believe it would offer.

Here's where things get a little confusing for us. See, after all this time, our recollection of the numbers involved is a little hazy, and so it would seem online as well. There are sites that say the MMX CPU had 52 (which is what we initially thought) added enhancements, others say 54, 57

and even 64. Furthermore, there's some argument over what MMX actually stood for. We always thought it was Multi-Media eXtensions, but others seem to claim it was actually Multiple Math eXtension, Matrix Math eXpansion and even Massive Media eXpression (which is a new one to us).

Its History

The original Pentium was released in 1993, combining the suffix '-ium', to make it sound like an element, with 'pent-' meaning five, because it was the fifth generation of processors.

As the Pentium gained ground in the home computer market, Intel started to experiment with extending its capabilities, and thanks to the new generation of multimedia applications and the PC becoming more of a gaming and entertainment base, the MMX element was a natural evolution.

The P55C was the first processor with the MMX enhancements, which continued with more modern processors, until it was eventually overtaken by SSE (Streaming SIMD Extensions).

The processor speeds were the fastest around, but more notable was the doubling of the L1 cache to 32KB. This is one of the main reasons the MMX performed as well as it did, at least until the Pentium M upped the game with a 64KB L1 cache.

Did You Know?

- AMD developed its own improvement to MMX, called 3DNow!
- According to the internet, MMX is officially a meaningless initialism trademarked by Intel.
- One of the main enhancements that MMX brought was Saturation Arithmetic, used in modern graphics routines.
- Some early P55C processors failed to switch out of MMX mode to floating point, so after playing a game and going into a spreadsheet, you'd find your PC slowing to a crawl.

Of course, the MMX side wasn't any use without the software written specifically for its use. Uptake was slow to begin with, but soon enough, and thanks to Intel not creating new MMX CPU registers, the developers caught up.

Interestingly, the MMX processing side was handled by allowing the enhancements to borrow from the CPU's floating point calculations. It worked, but in order to do so, the processor had to be switched from floating point mode to MMX mode, which took around 50 clock cycles. That meant developers had to limit the number of floating point entries to make better use of MMX in favour of processing speed.

The Good

Faster processors, better cache and media enhancements.

The Bad

Expensive to begin with, and all these new enhancements were a little confusing.

Conclusion

Although to the processor engineer MMX seemed to be flawed due to its design, it did the job exceedingly well – enough to catapult Intel into the lead when it came to home computing. **mm**



▲ The MMX processor, where all the good PC gaming started



▲ One of the many funky Intel MMX adverts on TV

Top 5

Sci-Fi Things We Wish Were Real

A few things sitting at the top of our fictional Christmas wish list

1 Hoverboards

Ever since *Back to the Future II* came out in 1989, we've wanted a real hoverboard, just like the one Marty McFly uses in that movie (or, perhaps, the rocket-powered Pit Bull board that his enemy, Griff, uses to fly across water). Sadly, even though we've now reached the date that Marty travelled forward to (21st October 2015), the consumer hoverboard has yet to become a reality. On the plus side, there are at least two working prototypes in existence: the crowdfunding Hendo hoverboard and one from car maker Lexus. Sadly, both are in their early stages, cost loads and don't really work all that well... yet.

2 Home Automation

Okay, if you have enough money, it's quite possible to get a computerised home these days, which can open your curtains, turn on the heating and lights, tell your fridge to order more food and just about everything else you could think of. In many ways, then, the sci-fi home of the future has already arrived, including the ability to use voice control to activate things. What we want, though, is the kind of home that Sheriff Jack Carter has in the TV show *Eureka*. Controlled by an AI called SARAH (Self Actuated Residential Automated Habitat), it does everything you could possibly want, including providing conversation in perfectly natural speech. Of course, being science-fiction, there was at one episode where it went wrong and nearly killed someone.

3 Robot Slaves

Of course, if you're able to create the kind of artificial intelligence that powers SARAH, then it would be a waste not to put that inside something that can move around, so it can go to your kitchen and make you a cup of tea. Obviously, that's not the only use we'd have for robotic servants, but that would likely be one of the most frequent. But it's not just the AI we need to figure out; we also need the kind of advanced robotics that would allow a machine to move easily around our houses, which, as you'd expect, are designed for human motion, not mechanical. Then we just need to decide, once and for all, whether you should put the milk in first or last (we say last).

4 Real VR

While the Oculus Rift, the HTC Vive and other such technology are promising big things, they're still just stereoscopic screens with head tracking, leaving us a long way from total immersion. What we want is the holodeck from *Star Trek: The Next Generation*, the Better Than Life game from *Red Dwarf* or the slug-like game pods from the David Cronenberg movie *Existenz*. We want, basically, to be in *The Matrix* (but not the sequels, because they were rubbish). Just imagine, you could go anywhere you want, do and see anything you like, whenever you desire. Personally, we'd go to a virtual reality where other people constantly make tea for us, while we fly around on a hoverboard, surrounded by people telling us how great we are and giving us high fives as we fly past them.

5 Mind Control

Before you go thinking we'd like to be able to control other people to make them do things for us (such as making cups of tea), that's not what we mean (although that would cool too). What we're actually referring to is being able to communicate with a computer just by thinking instructions. Amazingly enough, there are actually loads of toys and gadgets that you can control with thought power, as well as brain-controlled aids for people with disabilities. But we're not yet at the point where a computer can interpret every word you're thinking, so it can carry out advanced actions, including typing up documents and so on. That would be great, particularly if you're rubbish at typing. Of course, it would also mean government spies would have an even easier time picking out dissidents and locking them away in dark rooms without windows.... Oh, well, swings and roundabouts.



You don't need a mind-reading computer to know what he's thinking: milk and two sugars



Website Paywalls: Can They Work?

Could website content gated behind a subscription work or will the practice ensure the death of a site? Aaron Birch reports

The internet is seen by most as a free source of information. Whatever you want to know, you can find a site online, somewhere, that has what you need. Whether it's news, the latest movie reviews, reference material for an exam or simply the latest juicy gossip, it's all there. Sites are available for you to visit and soak up all that they contain.

This resource of information has steadily grown ever since the internet first launched itself on an unsuspecting world, and it shows no signs of stopping its meteoric rise any time soon. Success, however, doesn't come without baggage, and wherever there's success and a lot of public attention, advertisers and the desire for money soon follow.

With the need to pay the bills, site owners have to make money somehow, and as is the case with most forms of media, advertising is one of the easiest ways to do this. Offer a company the chance to advertise their product on your site for a fee, a site that receives plenty of traffic, and you'll quickly start to earn some cold, hard cash. Bigger sites have bigger advertising deals, and the money that comes in from this agreement to plug products on such a site can make a very respectable living. It's nothing new, and the internet certainly didn't start this trend. Magazines, radio and TV all ply their audience with advertisements, and this is where a good deal of revenue comes from. Newspapers, for example, make the majority of their money

The screenshot shows the homepage of The Wall Street Journal. At the top, there's a navigation bar with links for 'Subscribe' and 'Sign in'. Below the header, there are two news cards: one about Cisco and another about Google. The main article visible is titled 'Struggles in China Push Cisco to Strike Deal' by Eva Dou and Don Clark, dated September 22, 2015. A small note below the article says 'Read this in a desktop environment that highlights the difficulties facing journalists.' At the bottom of the page, there's a button to 'Read the Full Story, Subscribe or Sign In'.

▲ The Wall Street Journal is very famous and uses this fame to earn more money via its paywall

from advertisements, which is why the cover cost of the paper can be so low. The more people who buy it, the more eyes there are on advertising, and the more money advertisers will pay. It's a simple formula, but a formula that the general public isn't exactly fond of.

We've all been there. You're watching the Saturday night movie, getting into the atmosphere and losing yourself in the narrative when, bam! The adverts come along and pull you kicking and screaming out of your escapist bubble. It's a pain, and it often ruins programming for the viewer, but as much as we hate it, if advertisements weren't present, the cost of programming would fall to the viewer, as it always has done with ad-free channels like the BBC.

Digital Peddling

The internet quickly grew to embrace this advertising model, and not long after the first sites appeared, adverts followed. Things started off fairly benign, with simple banner ads and the odd pop-up, but today advertising on the internet is rampant. Practically no site or form of online media is safe from it. There's a whole mess of pervasive and often invasive advertisement techniques being used, such as full-screen pop-ups, pre-page load ads, ads in YouTube videos, ads in music streaming services, even ads in your installed programs. They're everywhere, and knowing how successful advertising has been in other media over the years, we can only expect it to get worse. That's the cold, hard truth.

One of the most recent forms of online advertisement exploitation is the idea of the website paywall. This is an idea that, while not solely based on advertising, plays on the general public's hatred of advertisements and is a method to do away with such content, making money at the same time. It's not limited to this model, and some sites use paywalls regardless of advertisements.

Simply put, a website paywall is a subscription service that locks content behind a paid model. By subscribing to the site, you're allowed access to the content behind it, and this can often include the benefit of no adverts. Once you're subscribed, you'll have full access to the whole site, and if you don't pay, you'll be barred from this content or, at the very least, have to view such content with plentiful ads.

The screenshot shows a paywall for The New York Times. The headline reads 'An Emphasis on Lace and Organza at Marques'Almeida'. Below the headline is a photograph of a fashion show runway. A large black box covers the majority of the page with the text 'Thank you for visiting NYTimes.com'. It includes links for existing subscribers ('If you are already a subscriber log in here.') and for subscription options ('To see subscription options click here.'), along with images of various devices displaying the Times's digital content. At the bottom, there's a line for customer service: 'For questions about your account, contact Customer Care at 1-800-591-9233.'

The New York Times is one of the bigger papers to have an online paywall in place

A good example of this kind of thing would be the system used by popular music streaming service Spotify, which has a free and a paid version. The free version is totally free to use, but songs are punctuated by radio-style, unskippable ads. The paid version has no ads and no interruptions to listeners' enjoyment. It's a simple idea and the chance of no ads is enough for many people to pay the small subscription fee.

This is all well and good for this kind of content, but when it's used to gate off normal, text-based content on a website, ads or not, it's something that quickly earns the ire of the web-using community.

Pay To Read

You may or may not agree with the removal of ads for a fee, but however you look at it, it's something that does actively improve your time on a site. Not having to see ads and only getting the content you want to look at is a bonus. However, the paywall that gates off content entirely unless you pay a fee is a little more troublesome.

There are plenty of sites that lack adverts but lock their actual content behind a subscription, and if you want to read it, you have

The screenshot shows the Experts Exchange website. A user has asked a question: 'How to connect my desktop to a Bluetooth or Wi-Fi'. Below the question is a 'Verified Answer' from a member named 'Topic'. The answer is enclosed in a box with a red border and the text 'Verified Answer'. It includes a summary of the answer and a 'Get Access Now' button. To the right of the main content, there's a sidebar with related questions and a section for 'EXPERT WHO ANSWERED' featuring a small green icon of Ireland.

▲ Professional help for technical problems is available – for a price

BUSINESS REVIEW

News Corp sites cement digital standing

Despite intense competition from a growing crop of content providers, news.com.au remains the most popular free website in Australia, while The Australian's website has cemented its status as the No.1 source for news among those with a

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LEARN MORE

▲ The Australian has a prominent paywall on its site, and it affects the readership figures

to pay first. Sites like The New York Times and Wall Street Journal do this, with the latter actively hiding the majority of a news story behind a subscription. It gives you a couple of paragraphs, but to read more, you need to pay. Likewise, some community sites do this. A popular site is www.experts-exchange.com (now with added hyphenation to prevent embarrassing confusion). This technical help forum hides answers to questions, which you often stumble on following a Google search, and to view them, you need to subscribe. Don't pay, and all you see is the question and a prompt asking you to sign up for a trial.

It's an odd way to promote such content but one that's understandable given the need for site owners to generate revenue. Few people do things in this world for free, and business is business, so from that standpoint, you can't really argue. That said, does this kind of system work?

High Price

It's difficult to say whether such paywalls on websites actually work without financial figures and viewing numbers, but given the prevalence of such sites, there's clearly money to be had. Taken from a user point of view, though, this is a practice that really isn't good, and it's not too great for the sites either.

You see, the internet is huge. It's a massive repository of constantly evolving information, and competition is rife. There's no monopoly on anything, and for every subject you search for, there are countless results most of the time. Because of this, it's hard to justify the cost of paywalled sites, as you can get the same or similar information anywhere else.

Take Experts Exchange, for example. It's a forum dedicated to technical help for computers, and it offers all sorts of detailed help to people who need it. That's great, but you can get the same type of help from a huge number of other sites – for free. Why pay a subscription on one site, when there are endless alternatives willing to give you help for nothing? Likewise, news sites that gate off content are unlikely to persuade the frugal user to part with cash when a simple Google search will reveal pages and pages of results for the very same information. We're sure this is an opinion shared by a great deal of people, so you have to wonder why some sites consider this approach and how it actually works, even to a small degree.

The answer is quality of content and unique features. At least, that's what paywalled sites will tell you. Sites that gate off content often justify this by claiming that it's of a better quality than other, free sources. Experts Exchange, for example, advertises the ability to speak to and get help from actual industry professionals. This plays on

the belief that most forums are just normal people giving advice, not qualified professionals. In many cases, this may be true, but how much difference does it make? Many community forums have members that are every bit as knowledgeable as so-called professionals, and there are even professional sites, such as Microsoft's own forums, that offer content for free. What makes Experts Exchange and others of its ilk different? Well, other features on offer include video tutorials, mobile access, specialised articles and the chance to write your own and more. There's a whole set of features on top of the simple technical help, and some of these may well be worth it, but not necessarily for users who simply want an answer to a simple question.

Paywalls can work, but even when they do, how successful are they compared to free alternatives? Let's look at some figures from July 2015, taken from various Australian news sites (via the Australian Business Review – www.theaustralian.com.au).

Here, figures showed that the most popular paywalled site, the Australian itself, managed 1.1 million unique visits in the month of

“ After scaling back the paywall, the Sun’s traffic increased two-fold ”

June 2015. That's a lot of visits and clearly a lot of money. However, the most popular free news site, www.news.com.au, managed 3.7 millions unique visits – over three times the amount.

It's telling, and it clearly shows the majority of users want free content and aren't willing to pay. It also shows that while those who are willing to pay are a minority, there's more than enough interest to generate plenty of revenue.

Even so, it's clear the user looking for free content is the type of user that's the most common, and most will simply turn away and look elsewhere, even if they have to put up with ads. There's enough of a disliking for this kind of paywall to create a bigger concern for site owners, however. That includes browser plug-ins.

Paywall Demolition

It didn't take long for programs and plug-ins to be released that allowed users to block adverts. The hugely popular AdBlock is one example and is used by many to block site advertisements, and paywalls are no different.

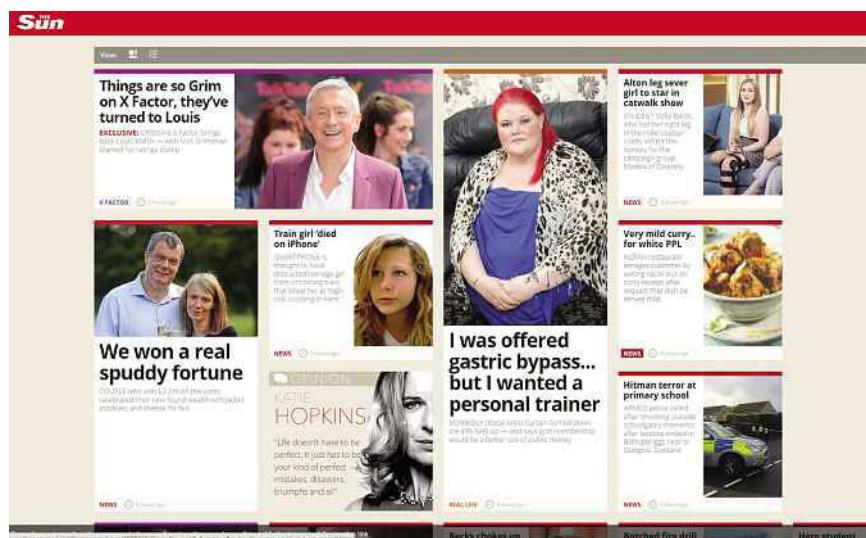
A lot of paywall systems work in the same way, and monitor your usage of a site using cookies. After you access so many pages,

Free v paid		Unique audience ('000s)	Unique audience ('000s)	Unique audience ('000s)
Free sites		8 Fairfax Regional	1256	5 Couriermail.com.au 1290
1 News.com.au	3722	9 HuffingtonPost	1032	Comprehensive paywalls
2 ABC News sites	2732	10 MSN News	918	1 The Australian 1099
3 Daily Mail Australia	2710	Moderate paywalls		2 AFR 452
4 NineMSN News sites	2532	1 Smh.com.au	3464	3 WSJ Digital 331
5 The Guardian	1955	2 The Age	1771	4 The Economist 230
6 Yahoo7 News sites	1783	3 The Daily Telegraph	1561	5 Crikey 205
7 BBC	1477	4 Herald Sun	1500	

Moderate = paid content available without subscription. Site may be metered. Extra mix of subscription and ad revenue. Unique audience = unique visitors per month. Data is preliminary and subject to audit. May not be representative of total unique visitors. Source: Nielsen Online Ratings, June 2015

Website ratings. Source: TheAustralian

▲ The Australian's figures on paid versus free website visitors



▲ The Sun used to have a strict paywall block, but scaled it back...

you'll be prompted to subscribe to see more. This is called a 'soft paywall.' Knowing this, programmers have come up with ways around it, including tools like the Firefox plug-in Paywall Pass ([mzl.la/1Mym3HZ](#)). This tool manipulates values in the referral header to trick the destination site into thinking it's your first visit, thus bypassing the paywall. It's a simple system and is probably easily blocked, but it's a clear sign that the paywall isn't as sturdy as people may like it to be. It's also a clear sign that people don't like them, and having them on your site is not only going to lose you visits but also maybe income, because tools are used to bypass them.

Sometimes, no software is needed, and companies see that paywalls just don't work. Although covered in a layer of spin, the Sun's website recently scaled back its paywall, which previously locked most content behind a subscription. Now the site's content is mostly free, although there are some stories and features you need to pay for. It's clear that the tabloid's higher-ups at News UK saw a decline in online readers and deduced that the paywall voracity was a little too strong. This was made all the more clear when viewing figures were released for the site by the Audit Bureau of Circulations (ABC), showing that the paper had only 792,994 unique visits on an average day in June 2015. This was compared to the the Mail Online, which had 14 million unique views per day in the same month.

After scaling back the paywall, the Sun's traffic increased two-fold to around 1.3 million unique visits per day, showing just how much of a negative effect a paywall can have, especially in an area with so much competition freely available.

Perhaps the ultimate fly in the ointment of paywall culture was The Daily Paywall. Created by Paolo Cirio, this was an online and print repository that smashed down the paywalls of a number of sites, including The Wall Street Journal, Financial Times and The Economist. The content was distributed for free, with only a humble request that people donate to the crowdfunding of the project.

Of course, this was all highly illegal and boiled down to basically stealing and plagiarising copyrighted work from writers and publications. The project was quickly shut down, and Cirio revealed that the whole thing was an experimental idea, partly exploring a crowdfunded alternative that would not only lead to writers being paid when articles were read.

Regardless of the real agenda of the project, the Daily Paywall caused quite a stir and polarised people's views. It sparked a debate about paywalls, with people talking about the rights and wrongs of the practice.

...Not entirely, though

Are Paywalls Acceptable?

It goes without saying that only the people running paywalls like them. Those who have to pay to get past the cash barrier never will. Are paywalls acceptable, though? Regardless of any personal opinion and dislike of the added cost, yes, paywalls are, at the core if it, perfectly acceptable, at least in terms of the idea.

Sites that put paywalls into place are merely exercising their right to charge for their hard work, often forgoing the extra income from adverts. It may only be text on a website, but often a lot of work goes into writing and researching this, so you can't really hold it against anyone wanting to earn money for that. After all, we all work so we can get paid, and those who run these websites are no different. Okay, so there may be multi-million pound businesses behind the scenes, but it's still business.

The problem with paywalls really comes down to our basic point from earlier, and that's user choice. As long as there are free alternatives and no single company has a monopoly on content, paywalls will never be totally successful. Everyone likes to get something for free, so paywalled sites will always lose traffic to those without. At the end of the day, it's the internet user sitting at home who can determine the success or failure of a site using a paywall. If you don't like it, don't visit: simple. The Sun learned that and was forced to change, and no doubt more sites will follow suit as long as the public reaction is similar. Just be prepared for a lot more advertising. **mm**



▲ The Daily Paywall may be dead and buried, but it was a telling experiment

Code With AI2

Speech Memo (Part 1)

Build an Android speech-enabled memo app with David Briddock

Over the previous nine issues we've used App Inventor 2 (AI2) to build a number of useful apps and recently explored animation techniques.

This time we'll build a handy memo taking app, with a speech recognition twist.

Remember, all you need to play along is a Windows/Mac/Linux PC, web browser and Google account. This time you'll also need an Android smartphone or tablet to test the app.

What We'll Learn

In this issue we'll play with the list view component and discover how to use lists in the coding side of things.

In addition we'll access Android's built-in speech recognition engine. While not always 100% accurate, it's certainly a much faster way to create a memo than typing – and more fun too.

Starting AI2

In your browser navigate to the AI2 home page (ai2.appinventor.mit.edu) and sign in with your Google account. We need a new project, so in the Projects menu select the 'Start new project' option and give it a meaningful name, such as 'MMSpeechMemo'.

Screen Properties

We're automatically taken to the Designer View, where there's already a component called Screen1. We'll drag and drop the other components onto this screen.

To the right is the properties Panel for the currently selected Screen1 component. In this panel, ensure the AppName is set to 'MMSpeechMemo', then set the Title to 'MM Speech Memo'.

Now we'll add some screen components.

Screen Components

The design of our screen is very simple: just an empty memo list and a single button. Instead of manually adding entries to this list, we'll manage the contents with code.

In the left-hand component Palette panel, open the group called User Interface, grab a ListView component and drop it onto the Screen1 area in the Viewer panel.

With the Button1 component selected rename it to 'AddButton'. Now move over to the Properties panel. Set the Width to the 'Fill parent...' option, set the FontSize to '20.0', click on the FontBold checkbox to show a 'tick', and finally set the Text to 'Add a Memo'.

An optional step is to change the AddButton's TextColor to Red.

Speech Recognition

We also need a speech recognition control. Back in the component Palette panel, open the Media group, grab a SpeechRecognizer component and drop it onto the Screen1 area.

“ The Android speech recognition engine transforms the spoken word into a text string ”

With the ListView1 component selected, rename it to 'MemoList'. Now move over to the Properties panel and set the Height and Width values to the 'Fill parent...' option.

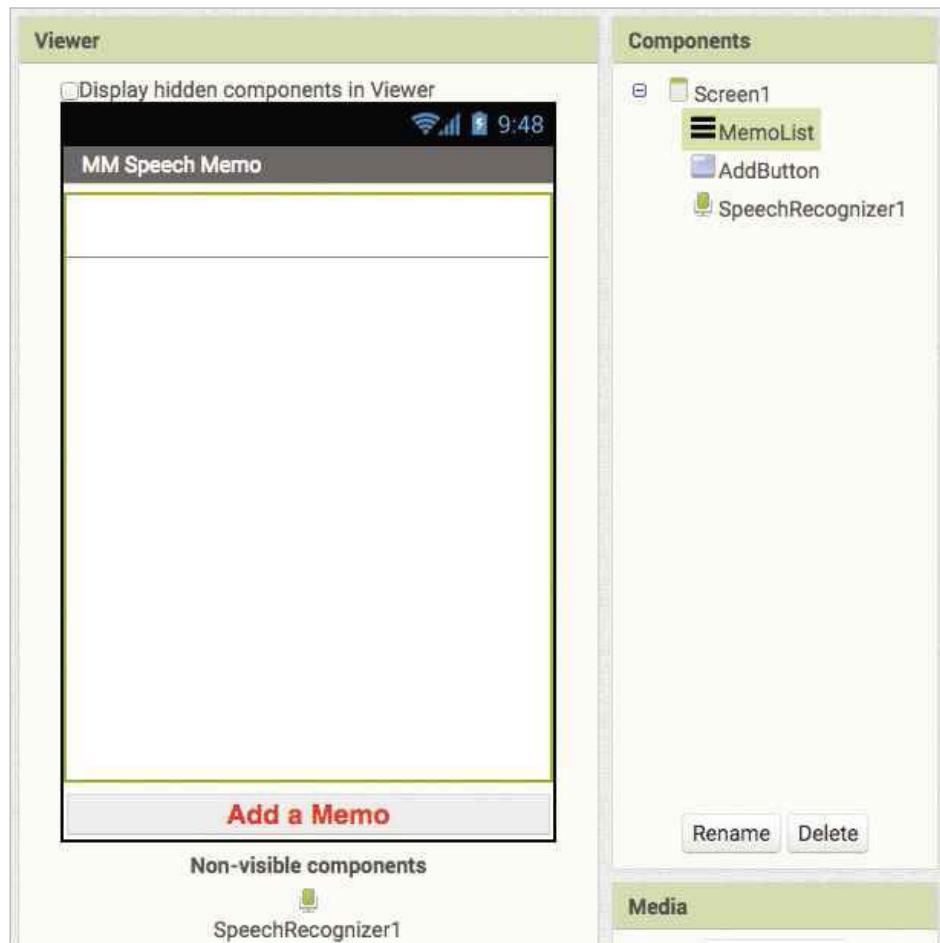
We'll also need a button. Go back to the Palette panel and grab a Button component from the User Interface group. Drop this towards the bottom of the screen. A blue bar appears to help identify the drop position.

Notice that SpeechRecognizer1 appears in the Non-visible Components area underneath the screen as well as in the Components panel.

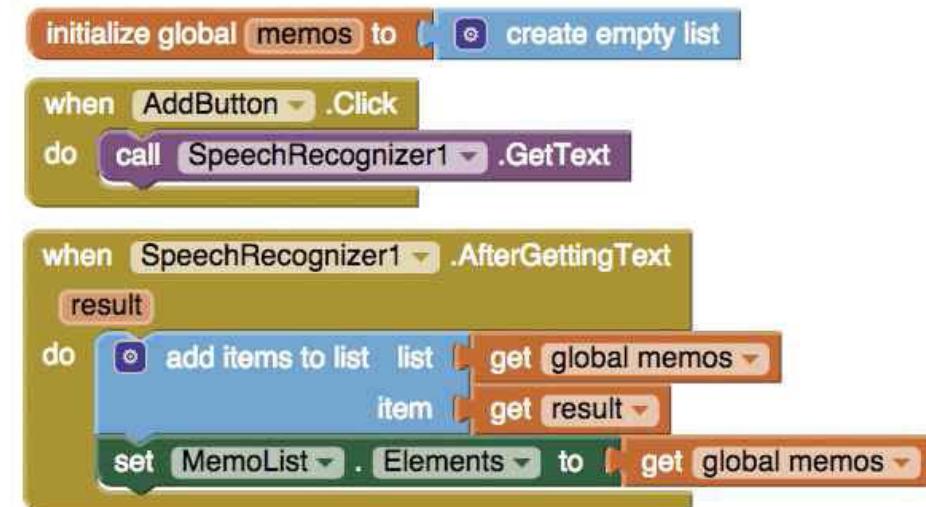
Coding

It's time to start coding, so click on the Blocks View button located on the green bar.

The contents of our memo list are managed through code. The first thing



▲ AI2 designer view



▲ AI2 blocks view

We'll need a data store to hold the list of memos. There are a few ways to tackle this problem, but AI2 has a comprehensive set of list management blocks, conveniently located in the Lists group.

The first task is to create an empty memo list global variable. Go over to the Blocks panel and open the Variables group.

From the list of blocks, grab an orange 'initialise global name to' block, then drop it into the Viewer panel's coding area. Click on 'name' and change it to 'memos'.

Back in the Blocks panel, open the List group and select a cyan 'create empty list' block. Drag this over to the coding area and snap it to the end of the orange global variable block.

Add Click Event

The next task is to handle an AddButton click event, which activates the Android device's speech recognition engine and transforms the spoken word into a text string.

In the Blocks panel, select the AddButton, grab a brown 'when AddButton.Click' block and drop it into the coding area. To populate the inner 'do' space back in the Blocks panel, select the SpeechRecognizer1 component, grab a purple 'call SpeechRecognizer1.GetText' block, and snap it inside.

Speech-To-Text Event

After the speech recognition engine has constructed a text string, it fires off an internal Android event. We need to capture this event and then define the post event behaviour.

To capture the event, go back to the Blocks panel, grab a brown 'call SpeechRecognizer1.AfterGettingText' block and drop it into the coding area.

Inside we'll start with a cyan 'add items to list' block from the List group. Notice this has two empty values. The first is set using an orange 'get global memos' block from the Variables group. The second is the 'result' attribute in this event handle block. Hover over it, grab the 'get result' block and snap it into place as the second cyan block value.

Finally, we need to update the list view on the screen. Grab a green 'set MemoList.Elements' block from the MemoList component, then snap it underneath the cyan block. To set its value, grab an orange 'get global memos' block from the Variables group and snap it at the end.

And that's the coding done. Ensure the warning and error counts in the bottom-left corner are both zero, then carefully check your code against the Blocks View image.

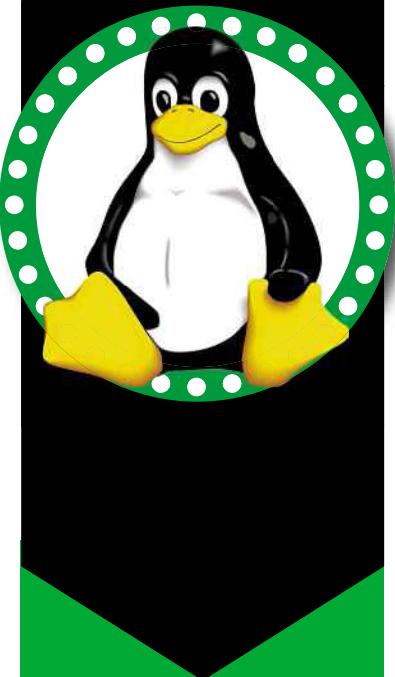
Testing

We can't use the Emulator for testing, as it doesn't recreate the speech recognition behaviour. Instead use the AI Companion App installed on an Android device (as discussed earlier in the series). You'll also need to be connected to the internet.

Going Further

This app works well as a rapid memo-taker and is fun to use. However, it could be better. If the app is closed or the device turned off, the memo list is lost, and we can't delete a memo.

Next time, in part two, we'll build a better solution by adding a file storage component and a touch-based memo delete capability. **mm**



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

Future Of Linux Under Threat

Could open source be crippling Linux development?

I was reading an interesting article the other day regarding the current slew of zero-day vulnerabilities, serious security flaws and other such bugs that exist in many distributions of Linux.

The likes of Heartbleed, Poodle and Shellshock had quite an effect on the stability and security of Linux and open source projects in recent months, so there are concerns that this is just the tip of the iceberg.

Currently, as one article suggested, Linux and the open-source community are enjoying a golden age of growth and prosperity, in terms of users and growth. However, Jim Zemlin, the executive director of the Linux Foundation, seems to believe that Linux could be "killed off" one day soon by the emergence of more software bugs and security holes.

As Zemlin said, "Almost the entirety of the internet is entirely reliant on open-source software. We've reached a golden age of open source. Virtually every technology and product and service is created using open source." But the problem lies in the fact that open-source material is poorly managed and drastically under-resourced, often developed and maintained by just a couple of individuals.

As an example, he explained, "OpenSSL for a long period of time was essentially maintained by two guys named Steve. Think about that." And what's more, OpenSSL was kept alive by donations amounting to less than £1,500 per year, with Bash receiving even less.

The worry here, of course, is that it wouldn't take much for

someone to insert a malicious item of code at some point in the development of a vital open-source project. Then thanks to the lack of funds, time and developers, that code creeps

a problem with Tor recently too? or some of the CMS, online projects? What's more, could this lack of resources to help thwart a security breach in open-source software leak over to Android

Heartbleed, Poodle and Shellshock had quite an effect on the stability

past inspection and is finally out there for everyone to use.

Linux Doomsday?

It does sound a little like one of the current slew of doomsday prophecies, doesn't it? However, it may have an element of truth in it.

While I don't think Linux as an operating system will become extinct due to a software flaw or security vulnerability, it does make you wonder about many of the other open-source resources we use on a daily basis.

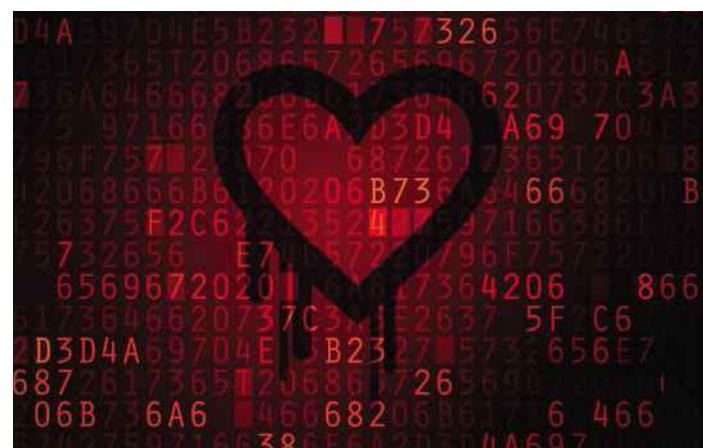
What about the various open-source VPN projects (wasn't there

and many of the other open-source, small computer projects that are currently in vogue?)

The result could be some nasty problems cropping up in a variety of devices. My concern is that the initial good work many individuals have put into an open-source project would be ruined should the problem reflect badly on them.

Anyway, what do you think? Drop us a line and let us know.

▼ *Heartbleed was very serious, but what will crop up next?*



News Bytes

Sven Harvey returns with some news bytes from the world of the Amiga

At the recent German Amiga 30 event, Cinemaware had a stand and showed off Amiga versions of *Wings Remastered*, which was the subject of a Kickstarter campaign for the PC version. The port is due to make its way to Amiga OS4, AROS and MorphOS – and an early version was being demoed at the event on all three, and it's reportedly looking fantastic. I'll bring you more information when it drops.

Also shown for the first time at the German event, Acube Systems has a new motherboard on the way that's intended for AmigaOS 4.x. The A1222, codenamed 'Tabor', has been developed in association with A-Eon Technologies, and initial information suggests it has a dual-core processor (believed to be a Freescale QorIQ P1022 PPC 1.2GHz unit) and 8GB of RAM on a mini-ITX motherboard. More information when Acube makes it available.

After being stuck in development hell for a decade or so, Hyperion Entertainment has also released Gorky 17 at the Amiga 30 event in Germany, and even offered it in an event exclusive bundle – find out more at www.hyperion-entertainment.biz.

Designed for A1200 owners who have installed a Subway or Rapid Road USB interface in their machine, AmigaKit has released a replacement rear panel to replace the standard blanking plate with one featuring two USB ports. Check it out at www.amigakit.co.uk.

Shadow Of The Beast

I was lucky enough at the recent EGX show at the NEC to play a beta version of the new PlayStation 4 reboot of *Shadow Of The Beast*. Developer Heavy Spectrum has clearly channelled its love of the original games, developed by Reflections (now part of UbiSoft), into this new edition for Sony Computer Entertainment (of which original publisher Psygnosis became part of the now unfortunately defunct SCEE Team Liverpool).

The game still takes the form of a 2D scroller (with scrolling in every direction, as the maps include ladders, ramps, steps and the like, complete, as you'd expect, with parallax layers), though the graphics are clearly 3D, and some sections move into a pseudo 3D game style, while still retaining the 2D gameplay mechanic. Although it's clearly an evolution of the game, with combos and evasion moves as well as the ability to stun enemies, it very much feels like the first game, especially when you're up against several adversaries at once (they even queue up like good little minions of evil as in the original game). It's clearly not finished yet, but nice little touches, such as 'Psygnosis14' or 'BloodMoney21' granting you an elixir within the demo, are present, and I do rather look forward to the release. I just hope they sort out the music and get Tim Wright in, after his excellent work on Beast 2 and 3 and the remixes of David Whittaker's original soundtrack for the Amiga Visual Compendium Kickstarter.

A gameplay video is available at youtu.be/pYANzO8n5Tc, or you may prefer it after a little CoLD StoRAGE here: youtu.be/UEBnppq7k5w.

Time Is Almost Up!

Three Kickstarter campaigns are scheduled to complete shortly after this issue of Micro Mart is published. Finishing in the afternoon of Sunday 25th October is the campaign to raise funds for the production of Amiga keycaps for Cherry MX switched keyboards of the ANSI and ISO standards. Fortunately, Loriano Pagni, who's running the campaign, has given the option of just getting the Amiga-specific caps to make the entry level as low cost as possible. Head on over to kck.st/1i5MVD8.

The morning of Sunday 1st November sees the conclusion of the campaign for the now fully licensed new cases for the Amiga 1200 in various colours. The lower reward levels include replacement trapdoors and the like for an existing case and mug options. You can find out more at kck.st/1hTsOrz.

Finally, later the same day, a second Kickstarter for *Bedroom To Billions: The Amiga Years*, to offer a special edition version of the release, which was a stretch goal that was only just missed on the original Kickstarter campaign. Read more at kck.st/1P8Ufu7.



Sven Harvey has been our Amiga specialist for over 16 years, drawing on his 25 years retailing computer and video games and even longer writing about them

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Ian McGurren is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

Your New Favourite Book

Ian McGurren looks at the latest offerings from Google and Microsoft

For the first time since their inception, this year sees no new Nexus tablet release from Google. That's not to say that there are no Nexus tablets available, as 2014's Nexus 9 is still available and for as little at £189 from some Google resellers (well, Argos). That's also not to say that Google isn't releasing a tablet either: meet the Google Pixel C. Pixel? That name's familiar... Ah, yes, it's the name of Google's £800 Chromebook for people who have an aversion to keeping money. Actually, that's not quite fair; the Pixel Chromebook is a stunningly designed device, and if it ran a more fully featured operating system, it would be an ultrabook to consider. But it runs Chrome OS, which presumably so does the Pixel C, right? Well, no, it's actually Google's first Android Marshmallow tablet and is only Pixel in style, not even having Chrome OS squirrelled away in a dual boot – a slightly strange change that casts some doubt over the future of Chrome OS.

With the ambiguity of the device's name out of the way, it's time to take a look at it, and a very nice device to behold it is. As previously said, the Pixel C naturally takes its design cues from its Chromebook step-sibling, looking like the result of an intimate encounter between said laptop and the first generation iPad (or a Microsoft Surface, depending on how you see the world), with nice aluminium sides wrapped round a decent 10.2" 2560 x 1800 screen with a not-too-big bezel. The bezel size is further explained by the add-on keyboard present in all the Pixel C publicity, with Google keen to

keep the Pixel heritage to the forefront. The keyboard is more Logitech than Surface but still looks great. Inside there's the next-generation Nvidia SoC, the Tegra X1, plus 3GB RAM, 32GB storage but, strangely for a 'pro' device (but not for a Google one), there's no micro-SD slot.

In other desirable tablet news, Microsoft released a MacBook Pro Retina. Well, no, that's not quite true, but it isn't as far off as you'd think, as the Surface Book is not only a stylistic match for the MacBook, but it also technically exceeds it and therefore becomes not only the best Windows 10 tablet, but also arguably the best Windows 10 laptop and one of the best laptops available. That might sound like hyperbole, but really Microsoft has been heading this way since the excellent Surface 3, and it seems with the Surface Book, it's hit the spot. The main headline is the staggering 3000 x 2000 13.5" 267ppi touchscreen (in the slightly wider 3:2 screen format), i5 or i7 CPU, a 1GB Nvidia GPU and storage from 128GB to 1TB. There are also two USB 3.0 ports, an SD card reader, miniDP, front and back cameras and 12 hours of battery time when used with the supplied backlit keyboard-cum-laptop-base. It's not cheap, but

starting at around £999 means it's in the same ballpark as the MacBooks, though it might just fuel the Mac versus PC debate further...

If you don't have quite that much to spend or don't need such power there's the Surface Pro 4, the not-surprisingly-similar sequel to last year's Surface Pro 3. While it might not be quite the visual and technological feast that the Surface Book is, the Pro 4 is still a superb device for Windows 10 users, and it isn't actually that far behind in terms of power, with the Core i5 and i7 options available along with a new option, the Core M, for the lower end. Memory ranges from 4GB to 16GB, storage from 128GB to 512GB, and you can expect to see the 'cheapest' model – Core M / 4GB / 128GB – to come in sans-keyboard at £749. Yes, that's close to the Surface Book when the keyboard is added in, but the Pro retains the keyboard cover, and the Book becomes a heavier laptop instead.

So there it is: two interesting machines and one possible game changer, none from Cupertino. That's a nice change to report, and shows that innovation in mobile technology is still happening, and sometimes it's coming from places you might not expect...



iPad Pro: Best iPad Yet?

Andrew Unsworth wonders if the iPad Pro will bridge the gap between mobile and desktop computing

It should be hard to get excited about the iPad Pro. It is, let's be honest, mightily reminiscent of Microsoft's Surface Pro when shown with its keyboard and stylus, which are named the Smart Keyboard and the Apple Pencil respectively. Yet a lot of people are excited by it, and so am I, because it provides the same portability as the Surface Pro but uses an operating system that was designed for touch from the start.

The iPad Pro is an exciting prospect for anyone who wants an effective balance between desktop productivity and mobile ease of use. It has a processor that Apple claims has almost double the processing power of the iPad Air 2 and twice the graphics processing power. The main CPU is backed up by a lower-power motion coprocessor, which is something that has become customary with iOS devices. Apple gives the editing of 4K videos as an example of the iPad Pro's processing power, and the prospect of editing Ultra HD video smoothly on what is a mobile device is certainly compelling. It indicates that you certainly won't have any trouble using the odd graphic and exotic font in Apple's iOS word-processing program, Pages.

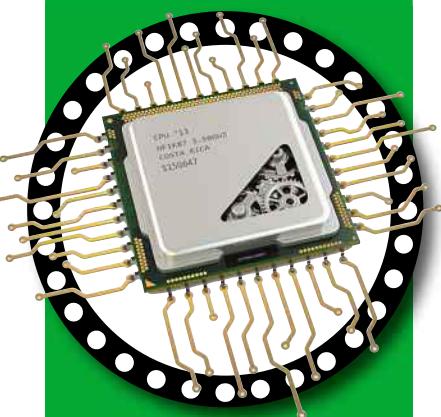
The iPad Pro's 2,732x2,048-resolution, 12.9in screen will ensure that users really can use the device to create

spreadsheets, write graphical text and even jot down a shopping list that'll be automatically synchronised with an iPhone thanks to iCloud. Pages is okay to use on iPad, but I've never found it that easy to use on the iPhone, on which I prefer to run the basic Notes app and then export the text to a desktop computer for formatting and tidying up.

There will be those who scoff at the thought of using an iPad as a decent productivity tool, but I've used an iPad as my main note-taking computer for years now. I'll use the iPad at press events because it's discreet, there's no annoying clatter when I type, and its long-life battery means it won't run out of juice just at the wrong moment. This last point is important, because there's nothing more annoying than having a procession of journo

interrupt a speech or demo to find a plug socket to recharge their laptop. If I want to type on a proper keyboard, I'll use my Logitech Ultrathin Keyboard for iPad, which lets me use keyboard shortcuts too.

You can share documents between iOS devices with iCloud, you can email documents to other devices and you can use cloud storage services such as Dropbox to share files between all kinds of devices. However, the iPad's lack of a USB port is something that has proved annoying in the past, such as at one press trip abroad when I couldn't access important files because they were on a promotional USB flash drive. Other than the lack of a USB port, the iPad Pro looks like a promising device. I can't wait to use one. Let's hope it really is a bridge between two computing worlds.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

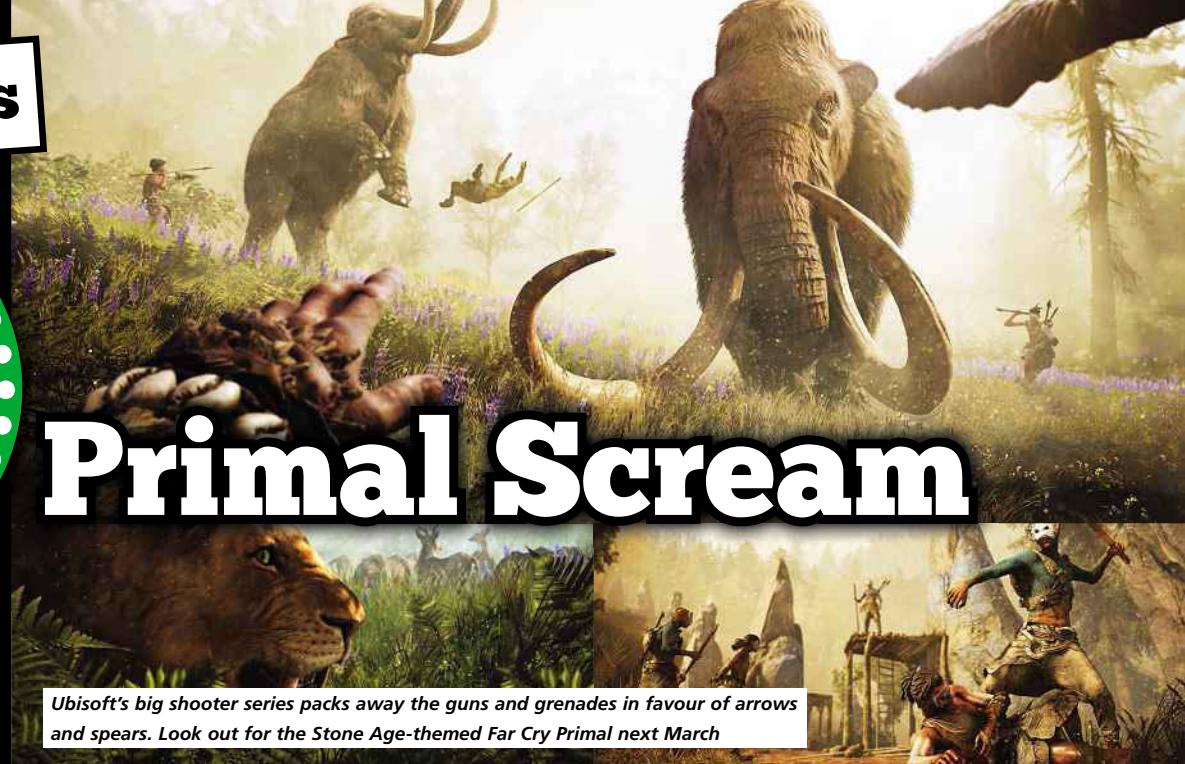
Except

Specialists



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Gaming



Primal Scream

Ubisoft's big shooter series packs away the guns and grenades in favour of arrows and spears. Look out for the Stone Age-themed Far Cry Primal next March

This week, **Ryan checks out Ubisoft's new Stone Age-set Far Cry entry, and takes a look at Julian Gollop's strategy revival, Chaos Reborn...**

Plug & Play

Far Cry without guns? Isn't that like designing a car without wheels? Curious though it sounds, this seems to be exactly what Ubisoft's planning with *Far Cry Primal*. In essence, the newly announced game appears to be pushing the survival angle of *Far Cry 3* and *4* to centre stage, except this time the action's set 12,000 years ago when life was tough and the weapons crude. You'll play Takkár, a hunter who's the last living member of his tribe. Here, the animals are as dangerous as anything else, with sabre tooth tigers and towering, angry mammoths all lurking in the undergrowth. Your job will be to craft weapons, hunt, and fight off a rival tribe, the Oros.

This isn't the first time Ubisoft has experimented with the boundaries of the *Far Cry* formula. Lest we forget, *Far Cry 2*, with its dusty environments, diseases and jamming firearms, was a world away (you might even say 'a far cry') from the relatively breezy tropical shoot-outs of its predecessor. Similarly, *Blood Dragon* was a refreshing spin-off from *Far Cry 3*, where that game's core engine was used as a basis for a delightfully cheesy action romp that aped 1980s straight-to-video movies.

"The interesting thing about *Far Cry* is that it's flexible," says Dan Hayes, *Far Cry Primal's* executive producer, "so when a team proposed to explore the idea of a *Far Cry* taking place during the Stone Age, we just said 'let's hear it!' And the more we heard about it, the more we realised how much of a damn good idea it actually was."

What isn't yet clear is whether *Far Cry Primal* will be a relatively cheap, circa £10 game like *Blood Dragon*, or whether it'll be presented as triple-A, lengthy experience like *Far Cry 4*. Certainly, the effort lavished on its first trailer (youtu.be/LJ2iH57Fs3M) and the sheer detail of its visuals might suggest that it's a full-blown, full-priced game. That *Primal*'s a collaboration between no fewer than four of Ubisoft's dev teams – Montreal, Toronto, Kiev and Shanghai – also lends weight to the theory that it's a major game rather than a small side-mission.

If this is the case, then Ubisoft will have to offer something more than a reskinned *Far Cry 4*, great though the 10,000BC trappings look. It's also fair to say that, while the survival elements added much to *Far Cry 4*'s atmosphere, things like hunting and skinning animals aren't to everybody's

taste. Ubisoft have handled the franchise superbly since they purchased it from Crytek, though, so there's every reason to be optimistic about the Stone Age take on this hit shooter. We won't really know for sure until it comes out in March 2016, though.

Online

The ideas behind strategy design legend Julian Gollop's 80s and 90s sci-fi tactical games still thrive today thanks to Firaxis' magnificent *XCOM* reboot; it's possible to trace that game's DNA back through *UFO: Enemy Unknown*, to the late-80s masterpiece *Laser Squad*, and even further back, to the budget *Rebelstar* titles for the ZX Spectrum.

Gollop's fantasy strategy game *Chaos*, however, remained in limbo after the 1990 sequel *Lords Of Chaos*, though the 1998 PC game *Magic And Mayhem* definitely contained some of its best ideas. Now, though, thanks to the power of Kickstarter, *Chaos* is alive and kicking again with the appropriately titled *Chaos Reborn*. Having garnered more than \$210,000 in funds last year, it's been in early access since, as Gollop and his team hone and fine-tune its turn-based action gameplay.



online-enabled *Chaos Reborn*. Up to eight wizards will be able to compete online, and with the overall aim to climb the ranks of wizardry to become a god, it promises to be a more intense competitive experience than ever.

Chaos Reborn leaves Steam early access on October 26th, and while not all aspects of the game are ready as yet, there are regular updates will fill in the gaps over the coming months. Find out more at www.chaos-reborn.com

Incoming

Call Of Duty is voyaging into sci-fi with *Black Ops III* and Activision's been showing off some of the exotic powers players can expect to wield as a cybernetically enhanced

super-soldier. Taking a leaf out of the *BioShock* series, *Black Ops III* will introduce a range of Cybercore abilities – Activision's equivalent of *BioShock*'s Plasmids. These range from Adoptive Immolation, which blows things up at the touch of a button, and Firefly Swarm, which leaves enemies screaming in a crowd of angry insects. Our favourite? Mass Overload, which basically allows you to leave bad guys crumpling to their knees from a deadly palm to the face. Yes, *Black Ops III* will finally let us slap enemies to death, *GoldenEye* style. Just take our money, Activision! You can stand behind us in the queue when *Black Ops III* goes on sale on November 6th.



▲ One of our favourite strategy games of all time makes a return. Julian Gollop's *Chaos Reborn* leaves Steam early access on October 26th. It should be well worth checking out

Taking the best chunks of *Chaos'* multiplayer and *Lords Of Chaos'* more expansive single-player campaign, *Chaos Reborn* again pits rival wizards against each other in a battle to the death. For most of us, it's the multiplayer that's the main draw; back in the 80s, we could only have dreamed of being able to play against our friends, attacking one another with dire wolves, golden dragons and other fantastical beasts.

This was always the brilliance of *Chaos*, and it's still the basis of *Reborn*: while the game's wizards are frail little things, it's the cunning deployment of spells that make them powerful. A well-placed lightning bolt or a cleverly

situated enchanted wood can make all the difference between life and death, while the casting of a single spell (most commonly, "disbelieve") can completely change the complexion of a battle. It's quite possible for a wizard to be dominating the battlefield with a deadly vampire or manticore one minute, only for a rival player to fire off an incantation like "decree" or "vengeance" that will make all their creatures disappear in a puff of smoke.

It's this balance between success and failure, law and chaos that made Gollop's game so nail-biting and engrossing, and it looks as though he's recaptured that spirit in his new,

▲ Activision's been showing off *Call Of Duty: Black Ops III*'s range of sci-fi powers, which will include swarms of fireflies and massive slaps to the face

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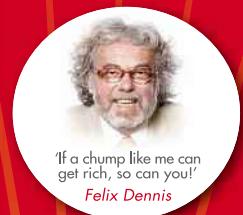
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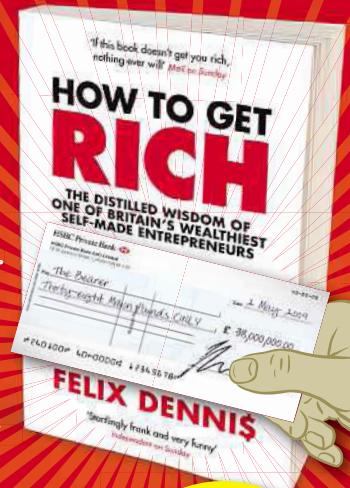
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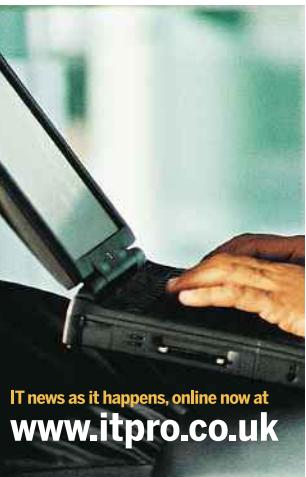
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Hard Drive. Excellent Condition. £37.50 included P&P. Flat screen monitors. Mainly 15" £20+p&p and 17" £30+p&p but have others on request. When packing I will make sure they have lot of padding to reduce risk of damage. Please email or call me for more information.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

IBM Thinkpad T30 laptop
for spares or repairs. Excellent condition, but does not bootup. Not sure why. Could be an easy fix or for parts/spares. £15 plus P&P.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Webcam (Trust Spacecam).
Boxed with CD of installation software and instruction manual. Perfect condition. £10.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

For Sale: HP Photosmart C4585 All-in-One multifunction colour printer. Perfect condition. Includes software discs and manual. £20
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Western Digital Cavier SE
Desktop Hard Disk Drive 160GB. In Perfect condition. Only £10
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Asus A8V motherboard, socket 939. Clips holding CPU cooler broke, CPU overheated & shut down. M/B should be OK and there is 4GB of ram on board. Free, collect only. North Wales.
Tel: (01286) 678584
Email: gw7hav@googlemail.com

Toshiba Portage i5 laptop.
2.5GHz Model R830-13c 4GB RAM, 320GB HDD. Wi-Fi, fingerprint scanner, HDMI output. Sold on eBay for over £200; only £150 plus £15 p&p. Bargain. Great condition, and a very light device.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

DESKTOP HARD DRIVE. 640GB Western Digital 3.5" SATA model WD6400AAKS. Perfect working order. Partitioned and formatted. Only used as back-up drive. Free delivery. Price: £33.
PayPal accepted.
Email: geofry@tiscali.co.uk

Seagate BarraCuda 250GB SATA Hard Drive 3.5". Tested and removed from a working environment. £12 inc Free Courier. Payment via PayPal.
Email: info@jmcomputing.info

XFX GeForce Nvidia 8800Gts
Graphics Card For Sale. £40.00 + Post. In perfect working order
Email: ken.toole1@virginmedia.com

LAPTOP HARD DRIVE. 160GB SATA 2.5". WESTERN DIGITAL. Model: WD1600BEVT. Fully tested. Perfect working order. Partitioned and formatted NTFS. Free postage. Price £22. Paypal accepted.
Email: geofry@tiscali.co.uk

DESKTOP HARD DRIVE. 640GB Western Digital 3.5" SATA model WD6400AAKS. Perfect working order. Partitioned and formatted. Only used as back-up drive. Free delivery. Price: £33. PayPal accepted.
Email: geofry@tiscali.co.uk

4x 1 GB DDR2 RAM (Ocz Nvidia SLI PC2 6400 epp 4-4-4-15) for Sale. £40.00 for all 4 + Post/ Packing. In perfect working order.
Email: ken.toole1@virginmedia.com

Vintage Amstrad PC1512 HD20. Colour Monitor 20MB Hard Drive 5.25 Floppy Original Amstrad Disks Manuals spare Keyboard and Mouse. This is a rare fully functioning collectable. £60.
*Tel: (01949) 876235
Email: hc4203@gmail.com*

4x 1GB DDR2 Ram (OCZ Nvidia SLI PC2 6400 epp 4-4-4-15). £40.00 for all 4 + Post/ Packing. Perfect working order.
Email: ken.toole1@virginmedia.com

Corsair Vengence 16GB (2x 8GB) DDR3 RAM CMSX16GX3M2A1600C10. Never used. Selling due to wrong voltage, these are 1.5V and I needed 1.35V. Asking £85 inc. postage to the UK.
Email: fabstock1@gmail.com

Laptop Hard Disk Drive. Fujitsu. 20GB. Excellent condition: £10.00.
*Tel: Gordon (01314) 660205
Email: scobieg09@gmail.com*

Corsair Vengence 16GB (2x 8GB) DDR3 RAM CMSX16GX3M2A1600C10. Never used. Selling due to wrong voltage, these are 1.5V and I needed 1.35V. Asking £85 inc. postage to the UK.
Email: fabstock1@gmail.com

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: Gigabyte GA-Z77X-D3H motherboard.
Email: johnbeirley@gmail.com

WANTED: PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.
Tel: Bill (07742) 061569 or (02641) 769503.

WANTED: Fractal Design Define XL full tower case. R1 (original version) in black.
*Tel: (01670) 860146
Email: mm@techron.co.uk*

SOFTWARE FOR SALE

Do you have old software that you simply don't use? Why not advertise with us?

Microsoft Office 2000 standard. Upgrade retail box only PART NUMBER 021-02661 £15 NEW AND SEALED. This includes the following WORD, EXCEL, OUTLOOK, POWERPOINT. If you need an upgrade path I can supply one for free. Please add £3 for p&p.
*Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com*

Microsoft Project 2000 retail boxed new unopened box. ONLY £20. Includes Microsoft Project Central and server software. Perfect to upgrading to the latest software at a fraction of the cost. Please add £3 for p&p.
*Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com*

Adobe Photoshop Elements

and Premiere Elements 12 Full Version - Windows/Mac. Original Boxed CD with unused product key. £47.50
*Tel: Ian (01932) 856971
Email: a2345@btinternet.com*

PCB design software 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99

*Tel: Nigel Wright (07967) 527693
Email: cresswellavenue@talktalk.net*

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
*Tel: Ian (01932) 856971
Email: a2345@btinternet.com*

Microsoft Office 2013. Original Software only £100.
*Tel: Gordon (01314) 660205
Email: scobieg09@gmail.com*

Sim City 2000. Boxed and original. Classic gaming. £15.
*Tel: Gordon (01314) 660205
Email: scobieg09@gmail.com*

SOFTWARE WANTED

Wanted: Instructions! A couple of long shots, but does anyone have instructions for the TEXET T581 BN programmable scientific calculator or the ZOOSTORM Fizzbook NL2 model [not the one available on the net - wrong model]?
Email: Alan Cox alancox28231@gmail.com

Wanted: PictureToExe software, for making picture shows.
*Tel: (01202) 610602
Email: ivor.mary@talktalk.net*

Wanted: Quicken 2001 UK Edition. I need to reinstall the program, but have lost my original installation CD.
Email: david.maddams@icloud.com

IMPORTANT BUYING ADVICE

We work very hard to police our classified ads, and make them as secure as possible. However, please do your bit too and use the following guidelines:

- **Never - NEVER** - pay by bank transfer or post out cash, unless you know the trader already, or are sure it is okay to do so. Pay by cheque, Paypal, Nochex etc wherever possible.

- Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@micromart.co.uk

- Keep copies of all correspondence

- When sending out goods, at the least obtain a certificate of posting from the Post Office

If you are in any doubt, feel free to send us a mail via editorial@micromart.co.uk.

Every year, thousands of successful transactions take place through our classifieds, and that's just how we like it.

Help us help you keep them one of the safest and most secure places to buy and sell computer kit.

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He's here to help you
with any general
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Dennis Publishing

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London

W1T 4JD

**Contact Aaron by email at:
aaron@micromart.co.uk**

**Please try to keep your
queries brief and limit
them to just one question
per letter, simply so we
can squeeze in as many as
we can each week. Please
include relevant technical
information too.**

Aaron

Windows 10 OEM?

I was thinking of upgrading my old E7500 CPU, motherboard and RAM to a new budget Skylake system, but I upgraded my Windows 8 Pro to Windows 10 Pro. My Windows 8 Pro was the initial upgrade release (first seven days you could buy it for £25), so I don't know if it is OEM or retail.

Is the Windows 10 free upgrade OEM or retail? By which I mean, can you change a major part of the system and then activate Windows, or must you buy a licence?

Andrew

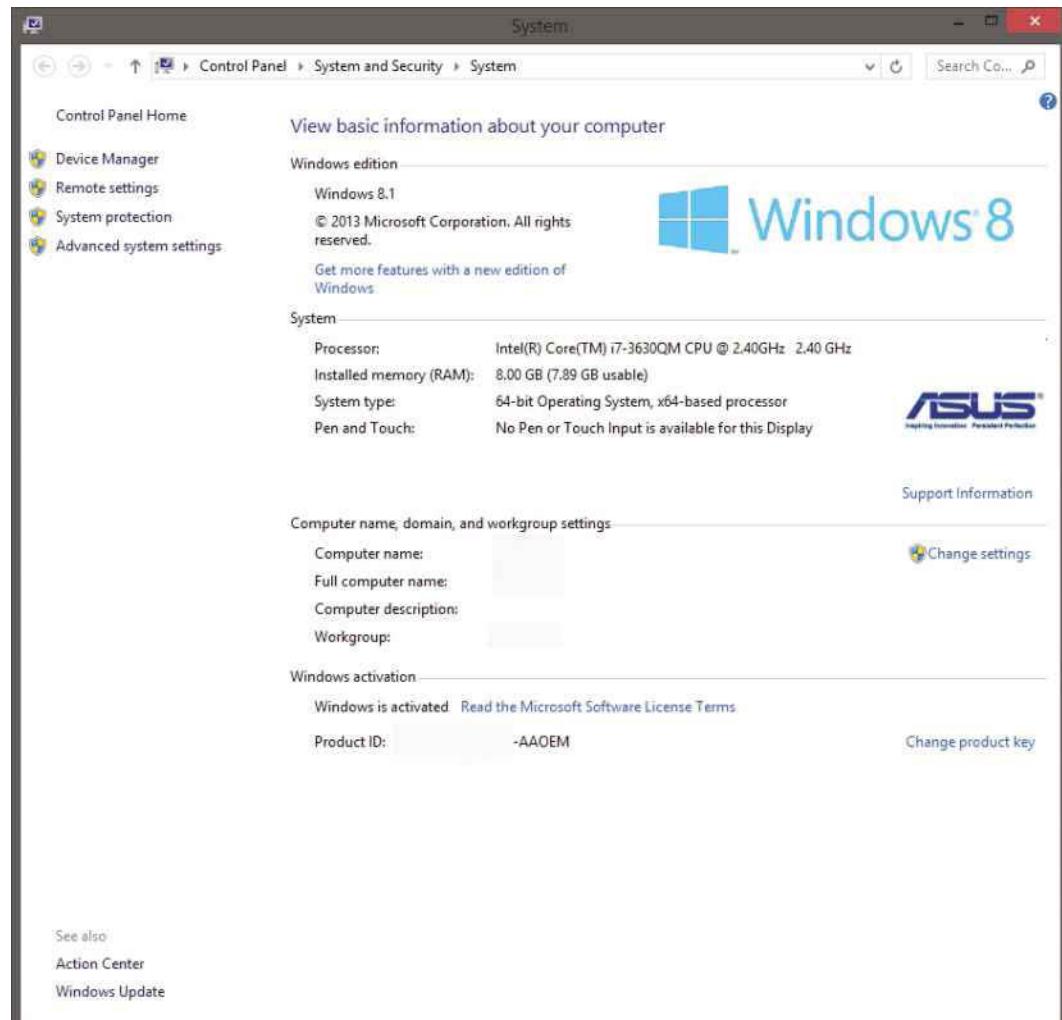
Microsoft has stated that the licence for Windows 10 will incorporate the agreement from your previous licence of the version of Windows you upgrade from. So if you upgrade from an OEM copy of Windows, the same rules and regulations apply. This means that Windows 10 will use the same calculations and routines to detect if your machine has

been altered enough to void the OEM licence. Upgrade it enough, and the OEM OS will no longer work or be legitimate.

However, upgrade to Windows 10 from a normal, retail copy of Window, and this won't give you any problems, because the same licence carries over to the latest OS.

If the copy of Windows 8 was purchased from a store and didn't explicitly state it was an OEM, you should be okay. Did it come in a box, or was it in a disc sleeve? If the licence key for the copy of Windows 8 you have is on a sticker attached to your PC, it's likely an OEM copy. If you're still not sure, you can easily tell by looking at your Windows activation information. Right-click Computer and select Properties. In the System window, look at your Product ID. If this ends with OEM, you have an OEM copy of Windows.

▼ *If your product ID ends with the letters OEM, you have an OEM licence for your copy of Windows*



Lost In The Mail

I have within the last few days purchased a Connect 10" tablet from Tesco. It was supplied with and is running a Windows 10 operating system. I believe that this tablet was supplied to Tesco by Viglen and is an almost identical unit to a Linx 10 tablet. For the price (£119, minus £20 Tesco Direct discount, minus Tesco vouchers equals £0), an absolutely fabulous buy.

The problem I'm having relates to the Windows 10 email client. Having set up the only account I have for emails (Plusnet), I am only able to receive emails, and however I configure the outgoing account (for both relay and SMTP accounts, excluding and including port references 25 and 587 respectively), the client fails to send emails, with the email being moved by the Windows client to the outbox on the tablet, and when the mail is attempted to be sent from the out box a banner appears above the email window which states 'Please make sure that you have added at least one valid email and try again'.

It does appear that this is a problem that has been identified by many who have purchased a Windows 10 system or have converted from Windows 7 or 8. There are many reports on the internet of this being an issue with the Windows 10 email client. My account with Plusnet works perfectly on my Hudl tablet and on my desktop system.

Plusnet has advised me that it's had many customers reporting the same issue to them (being able to receive emails but not send) when using the Windows 10 client.

Do you have any information or suggestions as to how this situation can be resolved without installing another email client on a tablet that has limited storage space and that to some extent would negate the usefulness of having a built-in email client.

It does seem amazing that even after all the pre-release testing that was carried out that such a fundamental failing should arise.

Terry

This does seem to be quite a prevalent problem for many users of Windows 10 and, as usual, more than one possible fix has been found, but what works for one user may not work for another. In an effort to sort this problem, let's

look at a couple of possible fixes that seem to be the most common in terms of success, beginning with the set up of a secure connection.

To do this, go into the mail client and into your advanced settings. Ensure you select the option for a secure (SSL) connection and make sure the IMAP port is set to the number required by your mail service. Likewise, do the same for outgoing SMTP. The ports advised by Plusnet here are 143 for IMAP and 25 for SMTP. As you've already tried, 537 is also a possible port number. Give this a go and see if the problem is solved. It's worked for some users, apparently.

Alternatively, it's been found that a possible problem is the fact that the setup routine for a new email account in the Windows 10 client doesn't actually ask for a specific email address, and this can cause problems. Plusnet doesn't use the email address as a login, as with many other email accounts, and this could be a problem. To get around this, go to add a new mail account via the normal wizard and scroll down through the list to get to the advanced setup. Here, select 'Internet email'.

Now, enter your account name. This is just to identify the account, so you can put anything, along with your screen name. Set the incoming email server as 'imap.plus.net' and the account type to 'IMAP4'.

For the username, don't use your normal Plusnet username, but instead type in your full email address, then enter your password. Type 'relay.plus.net' in the SMTP box and ensure you tick the 'Outgoing server requires authentication' option.

Under the outgoing server login section, use your normal Plusnet username and password and click Sign-in. With luck, this should now let you use your Plusnet email account through the Windows 10 app properly.

If this doesn't work, there has been an odd possible fix found that can help. This has been linked with Outlook, but it appears to have helped users of the mail client too. This simply involves opening up an admin command prompt and using the 'sfc /scannow' command. This will fire up a system scan for corrupted files and attempt to fix them. Once this is done (you may have to do it a couple of times), give the client a go.

▼ These settings may solve your Windows 10 email client SMTP problems

ASK JASON



Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Home Is Away

I pay £7.99 per month for Office 365 Home. I'd have gone for Personal, at £5.99, but I wanted my daughter to benefit, and as you know, a Home subscription provides five licences. Well, I've successfully installed Office on her laptop (as well as on mine), but her storage in OneDrive is merely the free 15GB. It was my belief that every Home user got 1TB (as I have). Or have I misunderstood? Is it 1TB in total, not 1TB per user?

B. Jones, Outlook.com

You've not misunderstood. I'm guessing you've set up Office 365 for your daughter by using your own Microsoft login. This means your daughter's Microsoft login isn't actually linked to your subscription – Microsoft just thinks the same user (you) is running Office on two different PCs (perfectly within the subscription's rules). To rectify this,

you need to create a 'share'. As you suggest, Office 365 Home can be shared with up to four other people.

Visit www.office.com and sign in (with the login used to buy the subscription). Scroll to the bottom of the page and click 'My account'. You'll then see an option called Share Office 365. Once you've selected this, you'll see another option: 'Add user'. Enter the email-address part of your

daughter's login – the password isn't required – and click Send Invite. Once she receives the email she'll just have to hit the Agree button and follow her nose. She'll then have the exact same Office 365 benefits that you do, though it might take ten minutes or so for that 1TB to show up.

▼ Be sure to take full advantage of that Office 365 subscription

Each person gets:

- Access to your available installs
- An account page to manage their own installs
- An extra 1TB of OneDrive storage
- 60 Skype minutes per month

Space Invader

Yesterday I upgraded my PC from Windows 7 to Windows 10. Everything appeared to go as planned, but today I've noticed my hard drive's nearly full. All I've done is install LibreOffice and AVG, but out of 320GB only about 25GB is left! I've looked in File Explorer and can't see what's grabbing all the space. Any advice?

H Wilson

This was a bug in some Windows 10 developer builds, but it was meant to have been ironed out for the retail release. I know myself that it can still rear its head, though. A laptop I upgraded a couple of weeks ago ended up with just 8GB free out of 250GB. I spent all of three minutes trying to figure out what was happening and ultimately just

opened 'Update & security' in Settings and did a factory reset. That soon sorted it.

Since then, however, I've read that such space is usually hogged by log files in C:\Windows\Logs. Open that up in File Explorer and browse through the subfolders. None

of the log files should be critical – Windows will just create new ones as needed – so give the old heave-ho to any with absurdly large sizes.

▼ If most of your storage vanishes after a Windows 10 upgrade, cast your eyes over your log files

Name	Date modified	Type	Size
dsvc.1887811.etl	14/10/2015 19:37	ETL File	32 KB
dsvc.2402651.etl	09/10/2015 17:51	ETL File	64 KB
dsvc.2833901.etl	09/10/2015 17:42	ETL File	32 KB
dsvc.2942341.etl	14/10/2015 19:44	ETL File	64 KB
dsvc.3712501.etl	09/10/2015 18:14	ETL File	128 KB
dsvc.4594371.etl	14/10/2015 21:10	ETL File	64 KB
dsvc.452029841.etl	13/10/2015 15:33	ETL File	128 KB
dsvc.876639521.etl	10/10/2015 18:23	ETL File	160 KB
dsvc.912095311.etl	10/10/2015 19:23	ETL File	64 KB
dsvc.936027031.etl	10/10/2015 19:49	ETL File	64 KB
dsvc.939055601.etl	13/10/2015 21:56	ETL File	64 KB
dsvc.1037820151.etl	03/10/2015 15:33	ETL File	64 KB
dsvc.1096326401.etl	16/10/2015 02:14	ETL File	64 KB
dsvc.11396215781.etl	04/10/2015 01:25	ETL File	64 KB
dsvc.1419556561.etl	18/10/2015 11:31	ETL File	128 KB
dsvc.1584435781.etl	11/10/2015 13:58	ETL File	64 KB
dsvc.1614793121.etl	11/10/2015 14:40	ETL File	64 KB
dsvc.1825474841.etl	04/10/2015 13:40	ETL File	128 KB
dsvc.1866593211.etl	11/10/2015 21:55	ETL File	160 KB
dsvc.2156721401.etl	12/10/2015 05:46	ETL File	64 KB

Another Photo Finish?

In issue 1381, David Wood was having a family crisis. 'When accessing her phone's 2GB microSD card, my daughter can only see 116 of her 611 photos. I've tried the card on my PC, via a USB reader, and there's a similar problem: Windows stops indexing after about the 16th photo and the card then disappears from Windows Explorer.'

He continued: "I've also tried copying the entire folder, but the process soon stalls with the following error: 'The destination you have specified does not exist.' This makes no sense, as there's plenty of space on my hard drive. The card disappears again too."

I replied thus: "I think the error message is a red herring. I reckon the microSD card has a corrupted file system or numerous faulty cells or blocks." I recommended getting Windows to scan the card for problems. I also suggested the card might be overheating, which could possibly be mitigated by copying just a few files at a time.

"If a lot of the files aren't readable or don't even show up," I went on, "have a crack with a recovery program." And if that didn't help, perhaps because of actual physical damage, I advised this: 'If the photos are valuable, consider posting the card off to a salvage specialist.'

Well, I was *nearly* on target...

All scans reported that the card was fine. So I followed your recommendation and began copying the files to my PC in small batches. All was good until I bumped into a file that caused the red-herring error message. As before, the card disappeared from Windows, so after I'd got it remounted, I skipped the file with the problem and started copying again. This happened a further three times. Eventually, the card had just four files left on it, presumably

corrupted and lost. All is now well, with a happy daughter and a tired but happy dad!

David Wood, TalkTalk

Many thanks for writing back in, Dave. I'm telling myself that you got to the bottom of the problem only because of my advice about copying the files a few at a time. I'm going to keep repeating that until I've convinced myself I was 100% right.

Memory cards aren't especially robust, I've found, and my recommendation to your daughter – more advice that will no doubt be 100% right – is to ditch that 2GB card and buy a new one (probably a bigger one). It's unlikely the photos were corrupted when they were written, and it's unlikely your daughter or the phone did anything to make them so. I expect some of the card's cells or blocks have run out of write cycles, and the other cells and blocks probably aren't far behind. It's time for the bin.

▼ **Memory cards don't last for ever**



Drat: It's Flat, Pat

I've had my Dell Inspiron 15 laptop (model 1545-4211) for about five years. Recently I bought a new charger, as the cable had become frayed on the original (sparks weren't uncommon). The laptop works okay, but now the battery doesn't charge. It used to work with the old charger – sometimes. The new one is labelled 'Replacement Charger', so it's probably cheap or generic. Is that the problem? Or could it be the battery? My university will be checking the laptop for PAT compliance, and I'm concerned it might fail.

Cashel O'Neill, Gmail

Pretty much all non-original laptop chargers read 'Replacement Charger', so don't worry about that. Are you sure yours has the correct outputs, though? I believe most Inspiron 1545 models require 19.5V and 3.34A (65W). The amperage can be higher (the laptop will draw only what it needs), but the voltage should really be on the nose (a little bit higher or lower is normally okay).

The charger clearly has the chops to run the laptop (and there appears to be no issue with the laptop's power socket), but is it up to charging the battery at the same time? Maybe not, but if it can't charge the battery even when the laptop's switched off, my guess is it's fine. Point your finger at the battery itself, Cashel, especially as you say the old charger only charged it 'sometimes'. If the battery is the original, and it's therefore five years old, it's definitely going to be on its last legs.

A replacement shouldn't be too costly – maybe £15 (for a non-Dell part). The original will have the product number GP952, I think, so search for that – eBay, as ever, is a good bet. Stick to sellers with loads of previous battery sales and with good feedback for them, and ensure that the item description specifically mentions the Inspiron 1545 series.

Regarding PAT compliance, I understand laptops don't need to be checked (except perhaps visually). They're too low-voltage. Only the charger has to pass the test, as that draws straight off the mains. There's no reason your replacement charger should fail, as the test is really just to confirm proper insulation. The working state of the battery won't matter.

▼ **Would a laptop with a knackered battery meet the PAT requirements?**

Crowdfunding Corner

It seems that a trend for modularity is rising in technology, and that's illustrated no better than with this pair of modular projects we found on Kickstarter!

Blocks: The Modular Smartwatch

It seems like smartwatches are coming out of the woodwork, but what do you do if the one you want doesn't exist? Maybe you can build it yourself using Blocks.

The core hardware, the Watchface, is that same for every Blocks smartwatch, with all the functions you'd expect from a smartwatch already built in. The difference between this and other watches is that you can add modules to the strap, which extend its functionality even further. Already developed modules available on Kickstarter include an extra battery, heart rate monitor, GPS module and NFC module. Planned modules, to be released in the near future, include a SIM card reader so you can take calls without a phone, a fingerprint reader to keep the device locked, an LED module for notifications or use as a wrist-mounted torch, and even a camera module.

This adaptability means that Blocks is, in theory, future-proof, because rather than upgrading your watch to get a new feature, you can simply add a new module that does the same job. Like traditional watches, you'll be able to keep this one for years.

The watches are due to start shipping in May 2016, and you can get a core device only (you can add modules later) for \$195 (£125), which is 25% off retail. If you want more, you can pay \$465 (£300) for a core device with a personalised watchface that's also engraved with your name, any four modules from the Kickstarter selection, plus the next three modules produced for free. An amazing package only available for Kickstarter backers! With a month to go, it's already tripled its original target, so it's fair to say the maker will be getting a lot of investment in this campaign.

URL: [kck.st/1hCLGKo](https://www.kickstarter.com/projects/1140733335/the-blocks-modular-smartwatch)

Funding Ends: Thursday, 19th November 2015



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Usheru

This week, David Hayward buys a tub of popcorn and settles down for some serious cinema-going

Although we can now have full surround sound, enormous 4K TVs and the most comfortable seats at our disposal in our living rooms, it's still not quite as much fun as going to an actual cinema.

Of course, at home, we don't have to spend £50 or more for a family to get tickets, a tub of popcorn, drinks and some wine gums (my favourite, in case anyone is interested). But more often than not, we go to the cinema not just to watch the latest blockbuster but to enjoy the experience – a form of art that sadly seems to be in decline, for a number of reasons.

What we need, then, is a better incentive to get out of the living room and put some bums back in to the old picture house. And this week's app may just be the solution.

"Let's All Go To The Lobby..."

Usheru is a new app to help you get the best out of a day out at the cinema. It allows a cinema to push information about what it's showing to the users of the app to help get some customers through the doors, while also giving you the best possible deal on what's currently available in London.

There are more than 50 chain and independent cinemas currently being mapped on Usheru, and with the help of the app you can single out a particular showing based on your location, your preferences and what deals you're interested in.

Not only do you get the latest deals on the actual films, but you can also find some pretty good offers on food and drink as

Features At A Glance

- Usheru delivers great cinema ticket offers for movies based on your preferences and location, which can be booked in seconds.
- Break away from the same old stale cinema night out with Usheru's selection of unique experiences at some of London's best chain and independent cinemas.
- Get first access to new and exclusive screenings and events.
- 50 chain and independent cinemas available – Picturehouse, Curzon, Everyman, Empire and many more.

well, and there are also opportunities to get involved in some of the more interesting and unique cinema experiences.

For example, you can find the latest special screening of a film or details regarding after-film parties or Q&As with the directors and actors. There are even instances of deals on rooftop screenings, early viewings of the latest blockbusters and other such events.

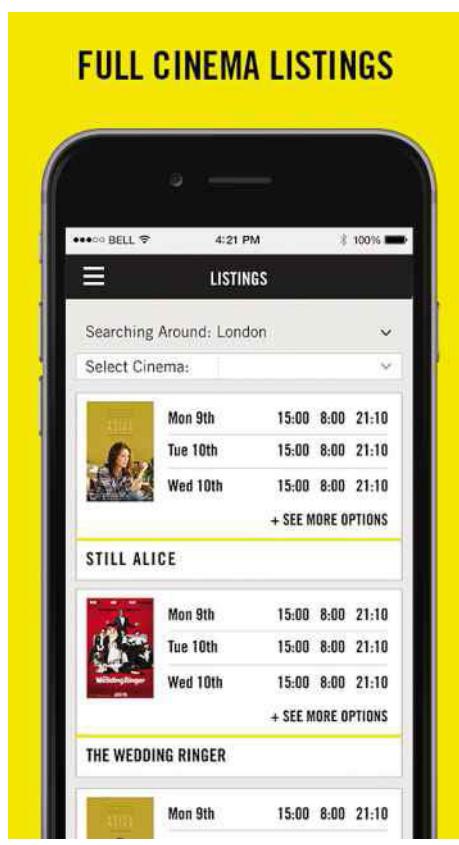
Furthermore, with Usheru, you can personalise the app to show you what's available that caters for your particular taste and you share that information to help others enjoy the experience with you, using the 'Get a Crew' element of the app.

Conclusion

If the lure of cheaper tickets and deals on food and drink wasn't enough, the thought that you might be able to enjoy a special screening or a more unique cinema experience is one that will certainly pique the interests of moviegoers.

But it's not just avid film fans who will benefit here. The chain and independent cinemas get to have people come through their doors once more, so they can lay on a better experience for their customers.

There's a lot to enjoy from Usheru, and it could become a vital element in a person's social life or just a handy tool for a family at the weekend. Either way, we're pretty sure you'll enjoy what it has to offer. **mm**



▲ Get to see what's on with the latest listings near you



▲ Find great deals on movies and events

Logging Off

I'm usually rather pragmatic about new technology, having seen lots come and go. But I've been getting worried about USB Type-C, or rather its failure to make the significant impact I would have expected of it by now.

Looking purely at the number of motherboards with ports and other devices to connect to it, one might reasonably conclude that this rocket ship isn't heading to the stars.

In fact, it's landed with the same general thud that usually accompanies a new Apple connectivity standard (where 'standard'

is a colloquialism for proprietary), and then people realise how much they'd have to pay Apple to use it.

What confuses me is that USB Type-C won't be expensive, and it does offer significant advantages in both what you can do with it and the lack of damaging incorrect insertions.

There is a very cynical part of me that wonders, probably quite reasonably, if hardware makers have been putting off using this new socket, knowing that USB port failure on both phones and tablets is one of the major factors in owners buying new ones. And should this become much less likely with the new port, it could actually damage sales.

This thinking ties in rather neatly with some horrible PC sales figures that various market analysts are trying to explain away by blaming Windows 10 and its notoriously unhelpful free upgrade.

There was a time, before Windows 7 actually, where each new release of Windows required an increasingly powerful machine, essentially forcing you to dispose of the old equipment to run the new OS. But even Microsoft couldn't come up with power hungry features that could overwhelm a modern PC, and we now assume that one that can run Windows 7 should be able to run Windows 8.x and Windows 10 just as effectively.

While that might be a major panic for the hardware makers, for the typical PC owner and any environmentalists, it's generally good news. More modern machines do generally consume less power, even if that probably doesn't balance off well against the huge amount used to source the raw materials and, through numerous processes, form them into a computer.

Back to USB Type-C. Is it ever going to happen in the way that it looked like it should? I still think it will, even if there appears to be some industry resistance putting some grit on the launch slipway of the HMS Innovation.

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What the USB implementers probably got wrong was that they made USB Type-C and USB 3.1 separate things, when they should have been one and the same, and not distinct from it.

That has created some confusion already, where people think that USB Type-C means USB 3.1, which it can, but not inherently.

Once we've cleared that up, possibly by using coloured connectors, then I think this new standard will soon get traction. We've seen an Apple product with it, the new Google Nexus phones have it, and even those new Microsoft Lumia's joined in.

But what we really need here is Samsung, LG, Motorola and HTC to all commit to only making phones and tablets with it, and that will get the ball rolling.

Once people see how much nicer it is and how rapidly it charges the phone, its general acceptance will get the much needed boost that it surely deserves.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Infinitesimal, 8 Attune, 9 Yuppie, 10 Neptune, 12 Oxfam, 14 Use By, 16 Sysprep, 19 Iframe, 20 Aurora, 22 Transmutation.

Down: 1 Knot, 2 Minuet, 3 Pigeons, 4 Kenya, 5 Tippex, 6 Validate, 11 Ensiform, 13 Dynasty, 15 Brains, 17 Purity, 18 Terms, 21 Root.

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The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. Cold hands, scraping frost off car windscreens, steam rising from your breath as you step outside. Yes, winter has truly arrived, and we're already hating it. It may well be the time of year that we get to wear a scarf (and we really like wearing scarves), but it's also when our gas and electricity bills go through the roof, as we turn up the heating, in an attempt not to freeze to death. Of

course, while we're rubbing our hands together to keep frostbite at bay, those who run the energy companies will no doubt be rubbing theirs together as they chuckle with malevolent glee, stopping only occasionally to twiddle their evil, pointed moustaches and to throw another bundle of £50 notes on the fire. Can we do anything to stop them and to keep some money in our pockets? Well, proper insulation of your home is important, and you could also always invest in lots of blankets and thermal clothing. But personally, we're just going to eat loads of chocolate and get fat, which will provide an extra layer of insulation during the winter months. Okay, it's quite possible the science behind this theory isn't quite reliable and that we're just looking for an excuse to eat more chocolate, but if you don't tell anyone, neither will we.

THIS WEEK'S CROSSWORD

Across

7 Expressible as a pure number not needing any units. (13)

8 A control consisting of a mechanical or electrical or electronic device for making or breaking or changing the connections in a circuit. (6)

9 Bad tempered or difficult to deal with. (6)

10 Relating to or involving volcanic or plutonic processes. (7)

12 Broke! (5)

14 A Japanese company headquartered in Kazo, Saitama, Japan, that specialises in graphics tablets. (5)

16 Computer graphics, which may be moved on-screen and otherwise manipulated as a single entity. (7)

19 A young foreigner who lives with a family in return for doing light housework. (2,4)

20 Modify a musical phrase by reversing the direction of pitch changes. (6)

22 The adage that 'work expands so as to fill the time available for its completion', and the title of a book that made it well known. (10,3)

Down

1 The visual appearance or an image of something when looked at in a particular way. (4)

2 A person who is advised, trained or counselled by a mentor. (6)

3 A relatively narrow strip of land (with water on both sides) connecting two larger land areas. (7)

4 A mechanical or virtual artificial agent, usually an electro-mechanical machine that is guided by a computer program or electronic circuitry. (5)

5 German theoretical physicist who originated quantum theory. (6)

6 Arouse hostility or indifference where there had formerly been affection or friendliness. (8)

11 Resembling or consisting of small grains or particles. (8)

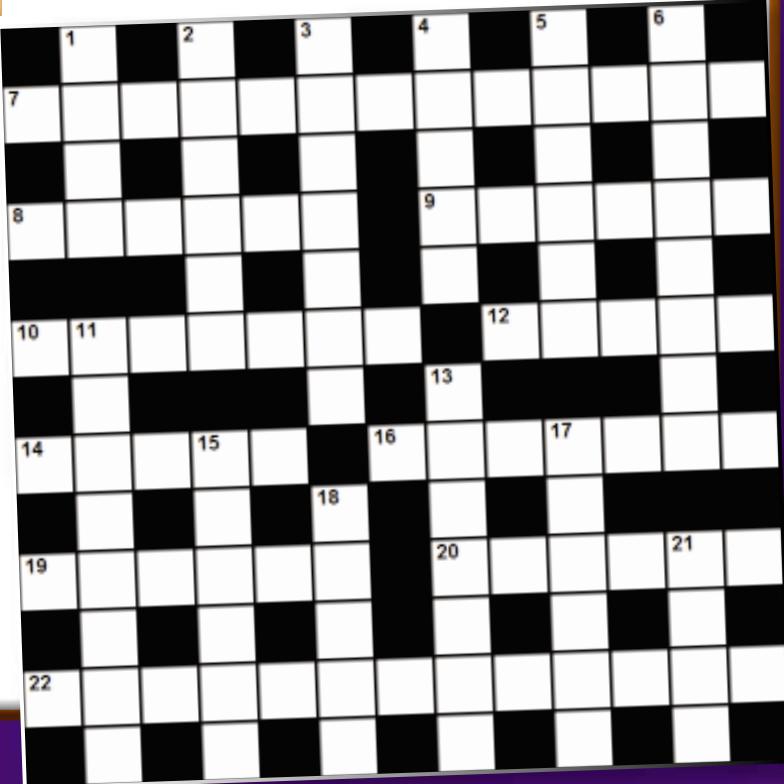
13 RGB (251, 206, 177) (7)

15 A kind of Serbian shoe made of soft leather and fastened with straps, similar in style to a moccasin. (6)

17 Spend money, time or energy on something, especially for some benefit or purpose. (6)

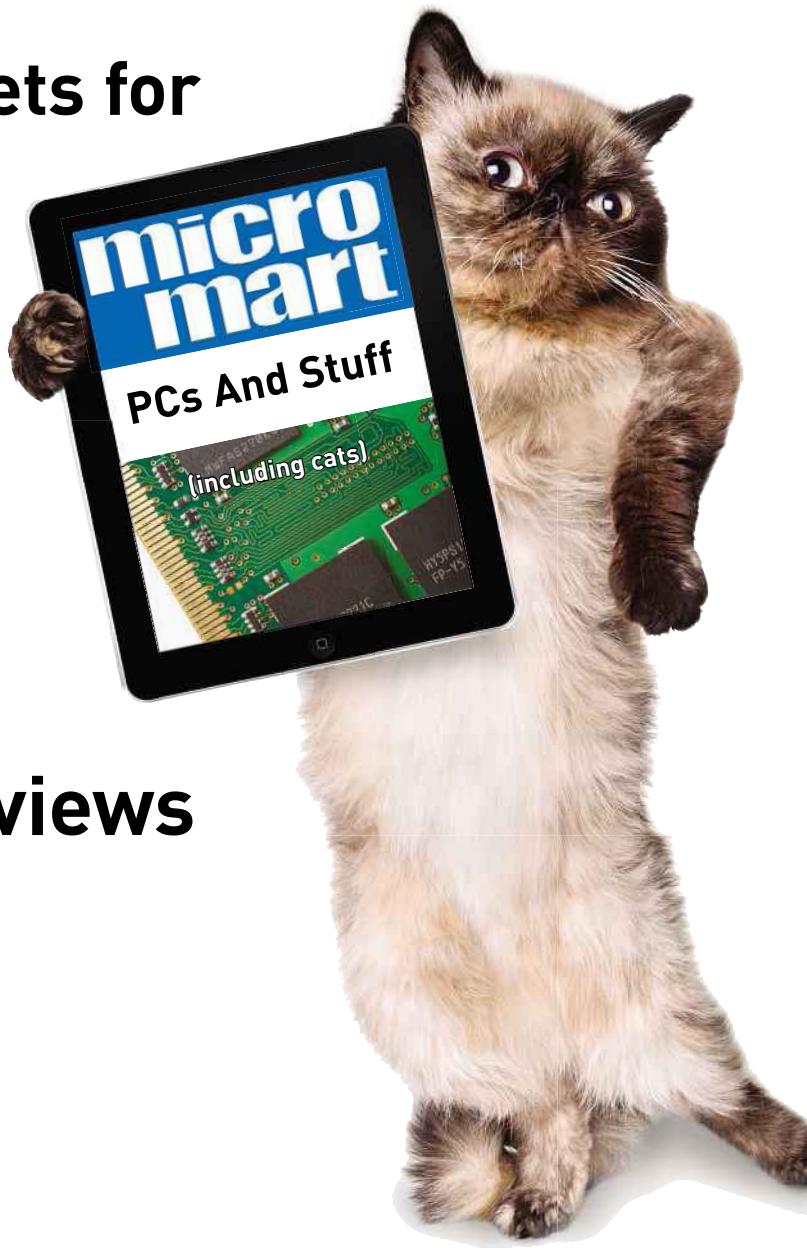
18 An aircraft without a pilot that is operated by remote control. (5)

21 The ability to connect to a mobile service away from home. (4)



In Next Week's Micro Mart*

- iSCSI: What is it, and what can it do for you?
- The 10 best gadgets for lazy people
- What's going on with Apple's new 'spaceship' campus?
- Plus the usual mix of news, reviews and advice



* May be subject to change

IT'S AS EASY AS CLOSING THE DOOR

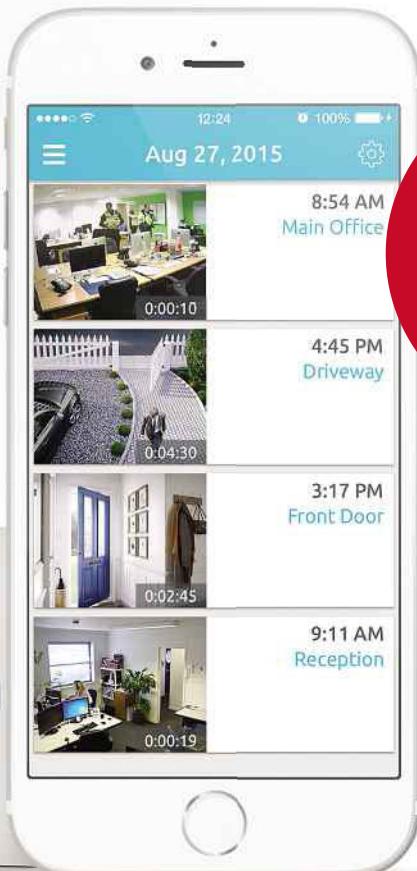
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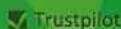
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